INDIANA HARBOR AND CANAL MAINTENANCE DREDGING AND DISPOSAL ACTIVITIES – DESIGN DOCUMENTATION REPORT

RAILROAD RELOCATION

APPENDIX F

U.S. Army Corps of Engineers, Chicago District
Civil Design Section, Design Branch

January 2000

RAILROAD RELOCATION APPENDIX
APPENDIX F
TABLE OF CONTENTS

LIST OF TABLES AND PLATES

PURPOSE AND SCOPE

1. The purpose of this appendix is to present the design criteria, engineering methods and procedures that were used to prepare a detailed railroad relocation and layout for rerouting the CSX side track crossing the ECI property to the northern portion of the property. This includes establishing the horizontal and vertical alignment, profiles and location of the relocated railroad track, calculating construction quantities and defining the real estate requirements.

2. The CSX Transportation Railroad Relocation is being performed as part of the Indiana Harbor and Canal (IHC) and Confined Disposal Facility (CDF) project. The project includes maintenance dredging of the IHC and disposal of the dredged materials in a CDF on the former Energy Cooperative, Inc. (ECI) oil refinery site. The CDF plan includes construction on a portion of the ECI property, which is separated by a 100 feet wide, multiple railroad track ownership/easement corridor. Most of the corridor was abandoned and is presently in use by one lead/side track operated by CSX Transportation. This lead track will be relocated to maximize an optimal dredged sediment placement plan that provides a more economical and constructable CDF design.

GENERAL

3. The project features consist of ballast system and roadbed, adjacent drainage ditches, grading, and slopes required for proper operation of the realigned railway track. The rail track system consists of the track line rails, ties, plates, spikes, anchors, and appurtenant supports. Requirements for implementing this plan include an optimal railway alignment for the relocated track including the curve design as appropriate and required for a single duo rail, side and lead commercial track line to compliment and fit the CDF perimeter, adjacent ditch and groundwater cut-off wall and the extension of the RCRA CAP under the relocated track. The groundwater cut-off wall is required to contain on-site contaminants as well as contaminants from the dredged material. For further information on the groundwater cut-off wall, see Appendix B, “Groundwater Protection”. The track design will conform to standard American Railway Engineering Association (AREA) requirements with the first and last 150 to 190 feet of track to be constructed by the railway owners and the track relocation right-of-way (ROW) will not exceed 60 feet. While this appendix provides an overview of the railroad relocation, details regarded the RCRA CAP, the groundwater cut-off wall and utility relocations will be addressed during the preparation of final plans and specification.

SITE LAYOUT

General

4. The site layout design information was developed on a CADD computer system using existing digital topographic and planimetric mapping. All computer work was performed within the Micro-Station software system.

Railroad Alignment

5. Calculations to determine the alignment of the proposed Railroad relocation were done with 100' tangents between reversing curves. Existing data was taken from Micro-Station topographic file. An iterative mathematical solution could have been made by hand but given the number of unknowns, a direct solution yielding a 100' tangent was not possible. Further calculations were made by using a computer spreadsheet and GEOPAK COGO. The relocation alignment in the DDR, with respect to the northeast corner of the CDF, differs from that shown on Figure 24 (page 112) of the CMP. The siding now crosses Indianapolis Blvd at 90 degrees. This realignment was necessary so that the existing railroad crossing at Indianapolis Boulevard could be utilized therefore eliminating the need for resurfacing and an extensive new crossing protection system. The revised alignment was designed to maximize space for the CDF while causing minimal or no impacts to Indianapolis Blvd. Plate F-2 shows the railroad relocation layout.

6. The solution for the alignment for curves 1 and 2 was obtained graphically in Micro-Station by modifying the arc angle of curve 2 so that a 575 radius curve (#1) could meet a #10-turnout, as provided by the railway owners, where the relocation matches back into the existing rail.

7. In order to maximize the amount of space available for the CDF, a trial and error method was used to design curves 3 and 4. The solution that maximizes the area was one that has a 100' tangent between the two 575' (minimum radius) curves 3 and 4. This was obtained using an influence angle, I2 = 79.9d for curve 4 and an influence angle I1 = 51.598d for curve 3. The tangent between the curves is 100.118'. See Attachment 2 for all calculations and assumptions.

Plan/Profile

8. After the alignment was inputted, plan and profiles were derived using existing digital topographic and planimetric mapping. The proposed profile was designed so that the railroad sub-base would not be affected by any surface water runoff. The profile was also adjusted to allow for the design and construction of a 3' RCRA CAP underneath the relocated track within the R.R. ROW. Standard F size sheets (40" x 28") were produced with 1" = 50' scale. These were then reduced to plate size drawings (11" x 17"). Plates F-3 to F-6 show the profile with the corresponding plan view. Plates F-7 to F-13 show cross-sections along the profile.

PROJECT FEATURES

General

9. As discussed before, the project features include the ballast system and

roadbed, adjacent drainage ditches, grading, and slopes required for proper operation of the realigned railway track. The rail track system consists of the track line rails, ties, plates, spikes, anchors, and appurtenant supports. In general, the design of the features follows that which was proposed in the Comprehensive Management Plan (CMP) and the CSX Transportation, Guidelines and Specifications for Design and Construction of Commercial Tracks except for minor modifications based on more detailed design analyses. Each feature will be discussed below.

Ballast System and Roadbed

Design Criteria

10. Roadbed width, ditches and slopes shall conform to current CSXT standard roadbed and ballast for industry tracks. This includes 2% subgrade slope, 6" minimum compacted subballast, and 6" minimum ballast at grade point center-line of track. If track is super-elevated then 6" minimum ballast is required below tie under low rail. For cut sections, minimum width of 10' for ditch and 2' for bottom of ditch. Track and ditch gradients may increase ditch size and its distance from centerline of track, and slope can vary as needed for stability from 2:1 in sand to ¼:1 in solid rock. For fill sections, slope as required by fill material (1 ½: 1 maximum) and geotextiles, if used, shall be placed between the top of the subgrade and the bottom of the subballast. Roadbed for commercial trackage within CSXT ROW and parallel to a main or operating track shall be constructed a minimum of 6 inches lower than that of the nearest main or operating track whenever drainage of the existing track can be affected by the new construction.

11. Turnout locations require additional roadbed to support the track structure and to provide proper walkways for CSXT train crews. CSXT requires that the roadbed taper from the existing section 100-feet preceding the point of switch (the point at which a track begins to diverge from another) to 18-feet from the centerline at the point of switch. The 18-foot roadbed is to extend from the point of switch to the transition with the 12-foot roadbed on the diverging track.

Project Design Specifics

12. The designed ballast system consists of a 9 ½ foot wide standard A.R.E.A. size 4-A ballast on a compacted 12" minimum sub-ballast with a 20-foot wide crest and 2H: 1V side slopes in typical cut cross-sections. 4-A ballast is defined as having 100% passing 2½ " screen size, 90-100% passing 2" screen, 60-90% passing 1½ " screen size, 10-35% passing 1" screen size, 0-10% passing ¾ " screen size and 0-3% passing 3/8 " screen size. Geotextiles are not required. In fill cross-sections, the sub-ballast crest widths vary. The crest width allows for a walkway extended from the centerline of the track on both sides. Plate F-1 shows typical cross-sections.

13. The subgrade shall be compacted and finished so that it directs water away from the track. The design slope is 2% from the centerline of the track on both sides. See Attachment 2 for all calculations and assumptions.

Drainage Ditch

14. The drainage system is sized to carry drainage without ponding of water against the roadbed. The ditch is designed to contain the drainage water as it filters into the site as normal. Drainage shall not be diverted, directed toward CSXT, or increased in quantity without prior approval and agreement with CSXT. Track roadbeds fills shall not be used as dams or levees for retention of water nor shall CSXT ROW be utilized for retention or settling basin.

15. The designed side slopes of the drainage ditch are 3H:1V with a 2-foot depth and 3-foot bottom width for constructability (Plate F-1). The profile was also raised so that the entire typical section is above the existing ground line.

Rail Track System

16. The rail track system consists of the track line rails, ties, plates, spikes, anchors, and appurtenant supports. The controlling elevation was the existing track elevations at the west and east ends of the project site. Curve information for each curve includes the intersection angle, degree of curve, radius, tangent distance, external and length of curve. Plate F-1 shows cross-sections of the rail track system.

Horizontal Curves

17. Trackage was designed using the minimum degree (maximum radius) of curve practicable. It is typical to use the chord definition of the degree of curve , which is defined as the central angle subtended by a 100 foot chord. It is denoted by Dc, where $\sin ½ Dc = 50/R$. Wherever practicable, a curve should begin beyond the last switch tie, but if required by special circumstances, a curve may extend onto the switch ties. In no case shall a curve begin between the point of switch and the heel of frog (the end of the point at which two running rails intersect within a turnout or crossing that is furthest from the point of switch).

18. A curve should be avoided at the loading point of a bulk loading facility or at an under track unloading structure. Spiral curves and super-elevations are not normally required, but, if required by special circumstances, shall be designed according to current CSXT standards. Tangents (straight sections), as specified in Attachment 1 - Design Criteria, shall separate reverse curves (curves following each other in opposite directions).

19. The designed curves met the above criteria. As stated earlier, the designed alignment for curves 1 and 2 was obtained by modifying the arc angle of curve 2 so that a 575 radius curve (#1) could meet the #10-turnout. The design for curves 3 and 4 was one that has a 100.118’ tangent between the two 575’ (minimum radius) curves 3 and 4. Additional information is provided on plate F-2. See Attachment 2 for all calculations and assumptions.

Grades and Vertical Curves

20. Track grades are to the minimum possible, consistent with terrain requirements. Grades were carefully designed to ensure that motive power available will handle the tonnage to be moved. This takes into consideration number of cars, whether loaded or empty, etc. Grades for "Load / Unload in Motion" trackage were designed so that a train is under power with no bunching of couplers while loading or unloading.

21. Frequent changes of grade were avoided. Vertical curves were provided at all grade changes, and were as long as practicable. Minimum standards for calculation of vertical curves are specified in Attachment 1, Design Criteria. Neither grade changes nor vertical curves are within the limits of switch ties. The designed curve information is provided on plate F-2. See Attachment 2 for all calculations and assumptions.

Staging/Storage Areas

22. Staging/storage areas are provided within the existing CSXT ROW as shown on plate F-2. Details will be finalized during the preparation of plans and specifications.

MATERIAL QUANTITIES

General

23. Quantities were either manually calculated or computer calculated using the InRoads or MicroStation software. They consist of track complete in place, ballast, sub-ballast, earth excavation, embankment, concrete removal, furnishing and placing topsoil and seeding, existing track to be removed, existing topsoil to be stripped, clay cap and #10 turnouts. The quantities are presented in table F-1.

Quantities Generation

24. Earthwork volume quantities include earth excavation, embankment and clay cap. Track complete in place length was taken between the stations 69+60.81 and 97+59.19. Ballast and sub-ballast tonnage was calculated. Concrete removal was calculated by taking the area of the concrete to be removed at a depth of 1 foot. Furnishing and placing topsoil and seeding was determined from the length of the relocation and the ROW with an allowance for the track complete in place to be installed. Track to be removed is assumed to be two complete sets of track line and includes removal of all tracks material and ties while existing ballast material will remain. All removed material is to be stockpiled on site. All removed material remains the property of the railroad and is stored for railroad pickup. Topsoil to be stripped was determined from the length of the relocation and the ROW Clay cap was determined from the ROW to the cut-off wall.

REAL ESTATE

25. Total land required for the railroad relocation is 4.11 acres. The real estate required for the track relocation and CAP requirements temporary work limits is equal to the permanent easements for the relocated track. All land required for the project is owned by the Non-Federal Sponsor except for ROW easements owned by the railroads. Plate F-15 shows the real estate for the railroad relocation.

CONSTRUCTION SEQUENCE

26. The first feature of the project to be constructed is the relocated railroad track. The RCRA cap will be installed within the relocated R.R. ROW. The sub-ballast and ballast system will be installed and then the railroad track will be constructed. Topsoil and seeding is done to complete the relocation work. As the relocated railroad track is brought on line, the existing track shall be abandoned. After the existing line is abandoned, the ROW will be stripped and excavated.

ATTACHMENT 1

Design Criteria

Design criteria to be used for sidetracks with operating speeds no to exceed 15 mph are listed in the following table. The criteria are not intended for Yard and Terminal track, Intermodal track, Branch or Spur Lines, or any trackage with operating speed greater than 15 mph.

CRITERIA	**INDUSTRY TRACK**	**LEAD TRACK**	**LOAD / UNLOAD IN MOTION**
Turnout Size Note: turnouts in main tracks shall be No. 10 or larger	Number 8	Number 10	Number 10
Maximum Curves Degree Radius	 12d-00'-00" 478.34'	 10d-00'-00" 573.69'	 10d-00'-00" 573.69'
Tangent Between Reverse Curves Preferred Minimum	 100' 60'	 100' 60'	 100'
Maximum Grade Loop Track * Uncompensated ** Compensated at 0.04% per degree of curve	 2.5%*	 2.5%*	 1.5%* 0.7%**
Vertical Curve Summits Sags Length	 40 x algebraic differences in grades 50 x algebraic difference in grades 100' minimum	 40 x algebraic differences in grades 50 x algebraic difference in grades 100' minimum	 400 x algebraic differences in grades 500 x algebraic difference in grades 100' minimum

ATTACHMENT 2

Design Calculation and Assumptions

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CALCULATION COVER SHEET

Client: USACOE Project Name: CSX TRACK RELOCATION

Project/Calculation Number: 05-000354 77.19

Title: PRELIMINARY DESIGN CALCULATIONS AND QUANTITY TAKEOFF

Total Number of Pages (including cover sheet): _____ Total Number of Computer Runs: _____

Prepared By: MARK T. HEATON Date: _____

Checked By: DANIEL J. LOFTUS Date: _____

Description and Purpose:

DEVELOP AN ALIGNMENT FOR RAILROAD LEAD TRACK THAT ADDRESSES CSXT COMMENTS AND MAXIMIZES SITE REMAINDER FOR CDF CONSTRUCTION.

Design bases/references/assumptions:

① TOPO/CONTOURS AND PRELIM. ALIGNMENT BY COE.
② CSXT DESIGN STANDARDS AS PROVIDED BY RAILROAD
③ AREA: "MANUAL FOR RAILWAY ENGINEERING", 1996
④ COMPUTER GENERATED QUANTITY/DESIGN CALCULATIONS MADE HEREIN USING MICROSTATION/GEOPAK.

Remarks/conclusions:

① HORIZONTAL ALIGNMENT MEETS BOTH GOALS OF DESCRIPTION.
② PRELIM. REVIEW OF ALIGNMENTS INDICATE MINOR MODIFICATIONS ARE REQUIRED PRIOR TO CONSTRUCTION, BUT IS ACCEPTABLE (e.g. 200' V-C & 10° CURVES)
③ UTILITY CONFLICTS NOT SHOWN IN CALCULATIONS OR PLANS, PENDING APPROVAL OF PRELIM. ALIGNMENTS.

Calculation Approved By: _____ Date: _____

Project Manager

Revision No.:	Description of Revision:	Approved By:

Project Manager/Date

01/08/99

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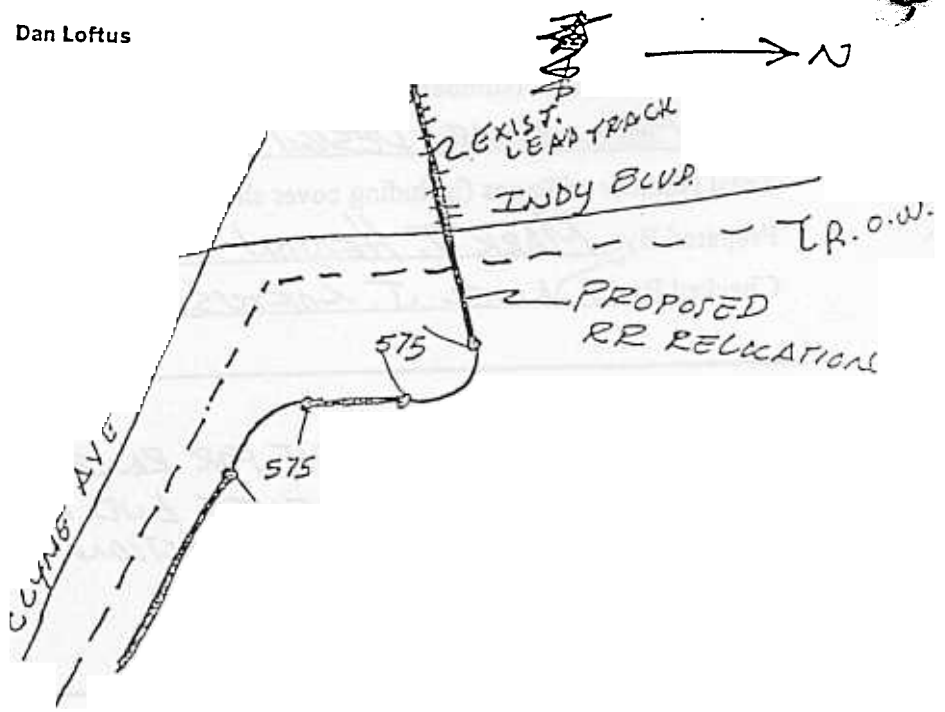

CALCULATIONS TO DETERMINE ALIGNMENT OF PROPOSED RR RELOCATION WITH 100' TANGENT BETWEEN REVERSING CURVES. EXISTING (GIVEN) DATA TAKEN FROM TOPO FILE (MICROSTATION).

PREPARED BY: DAN LOFTUS

DATE: 01/11/99

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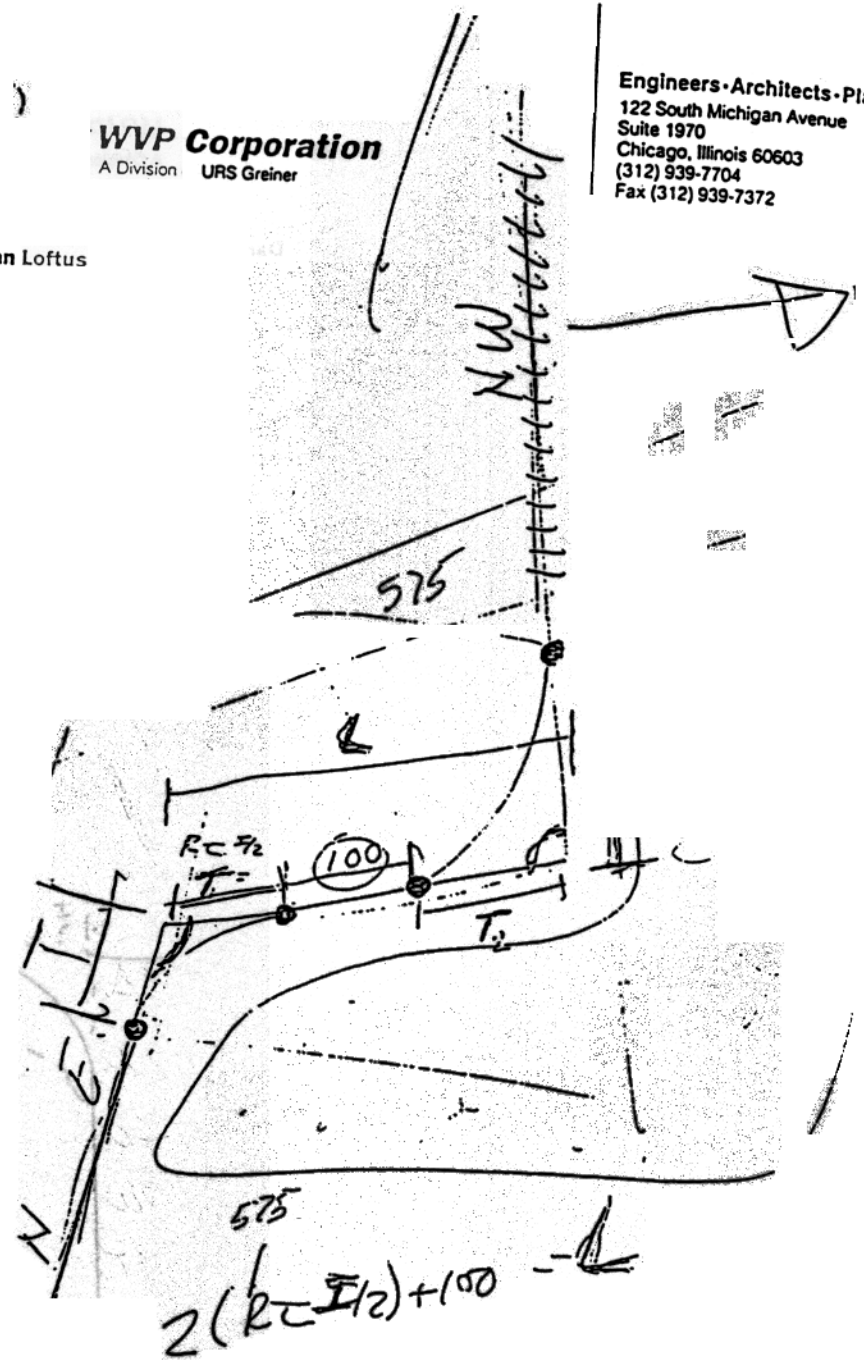

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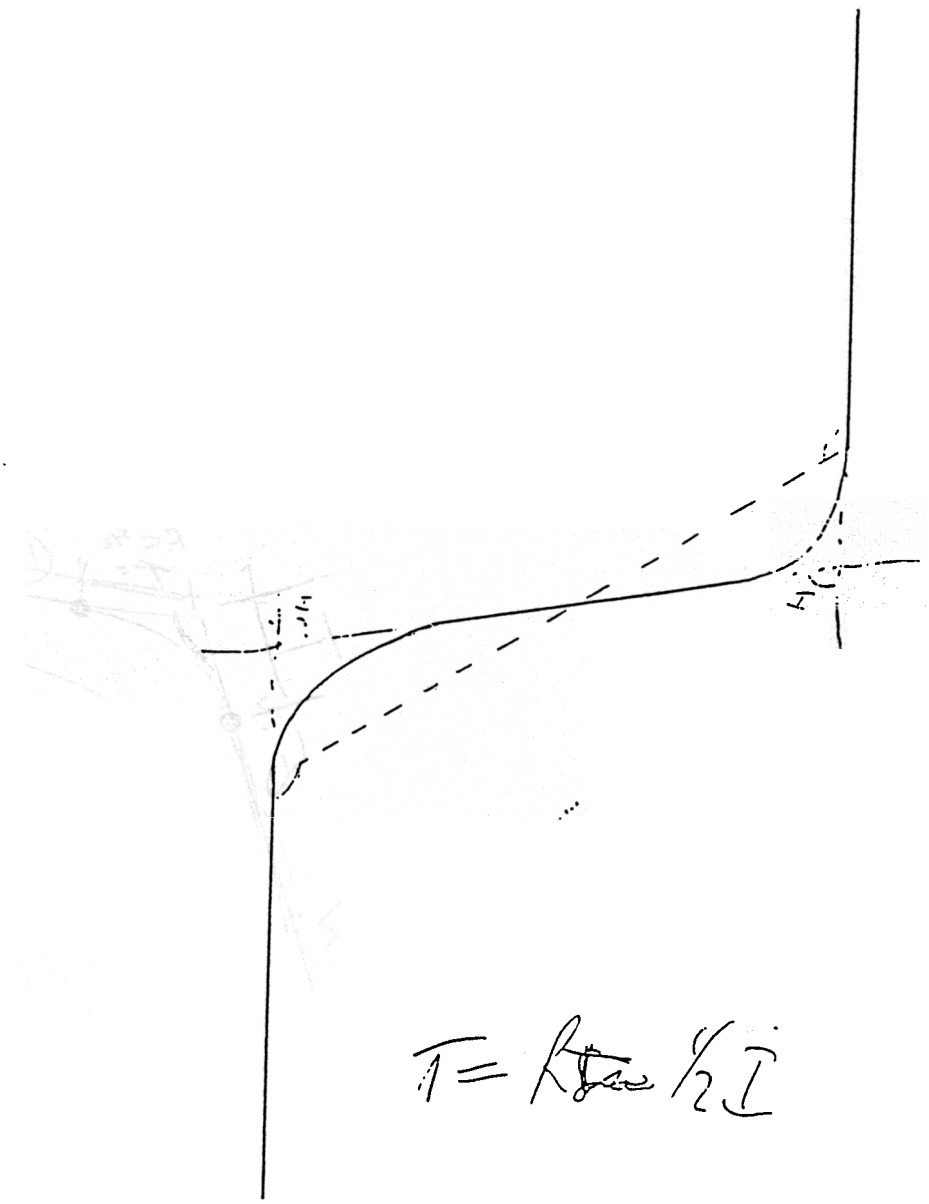

$T = R \tan \frac{1}{2} I$

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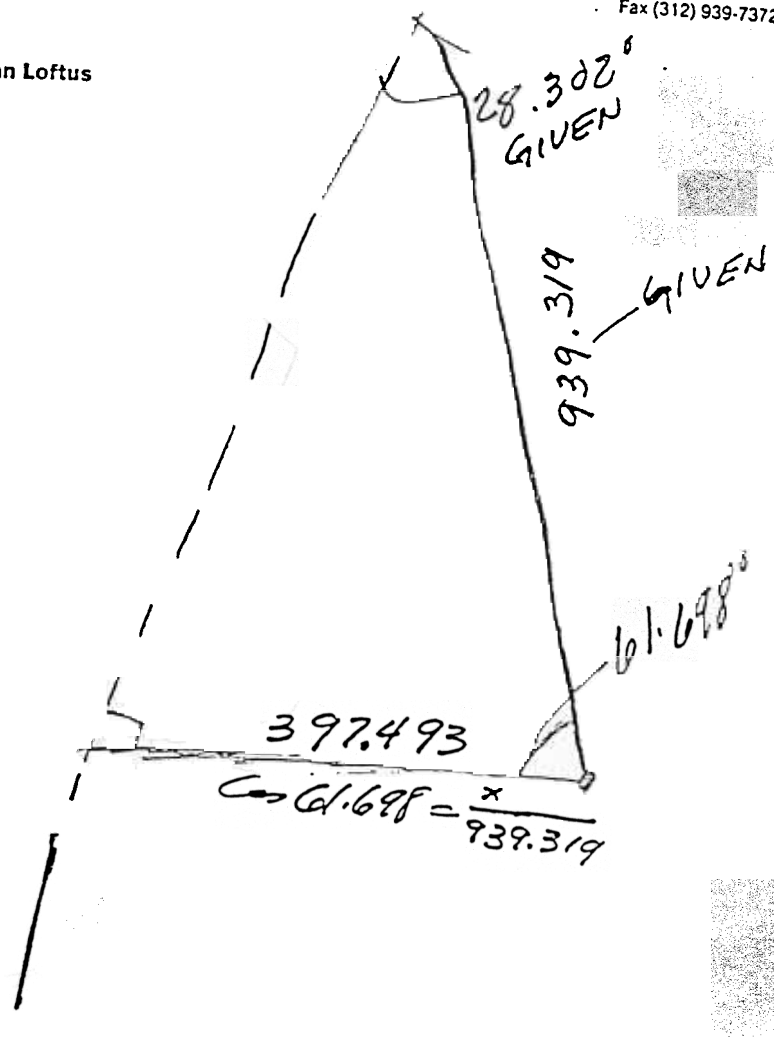

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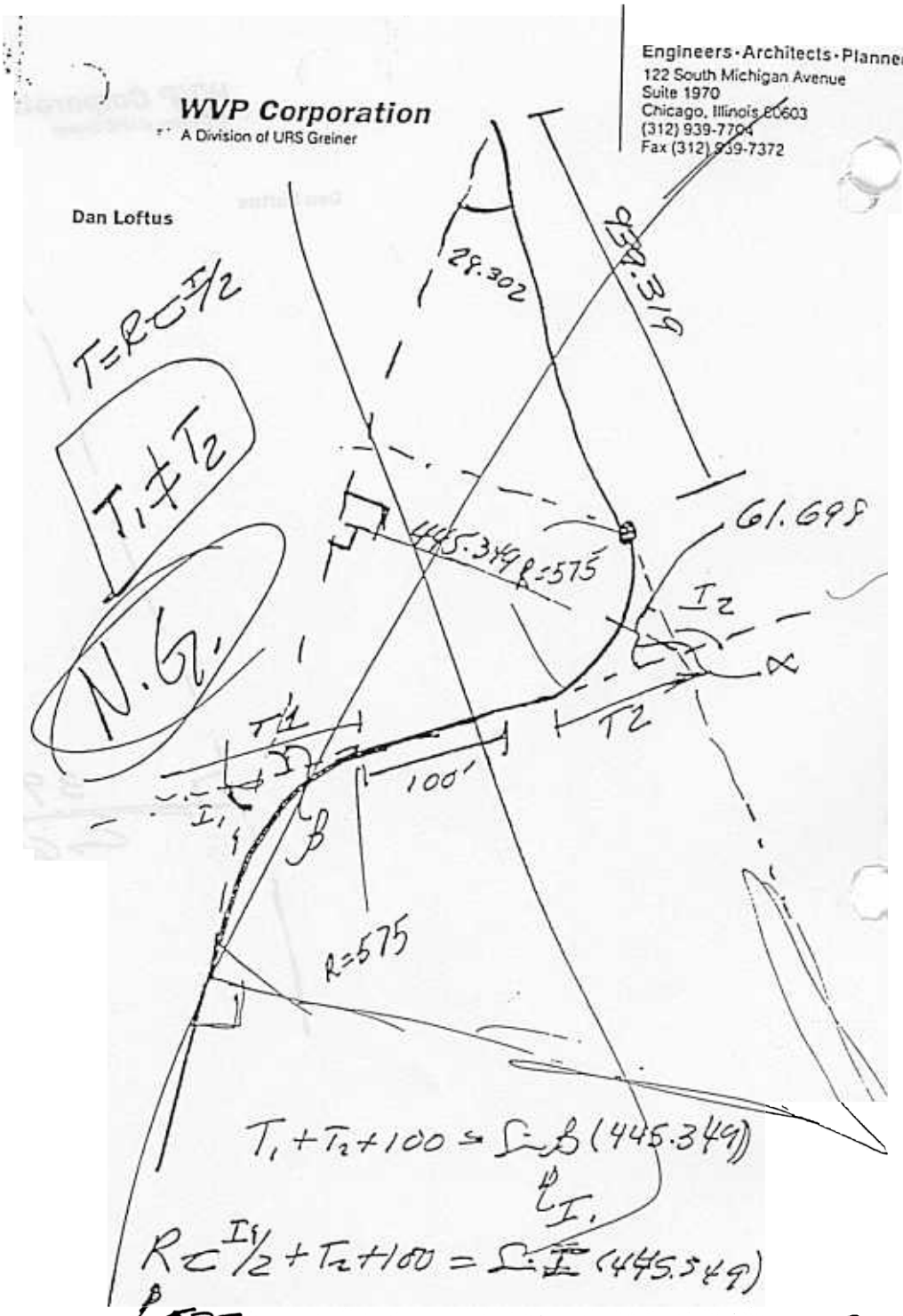

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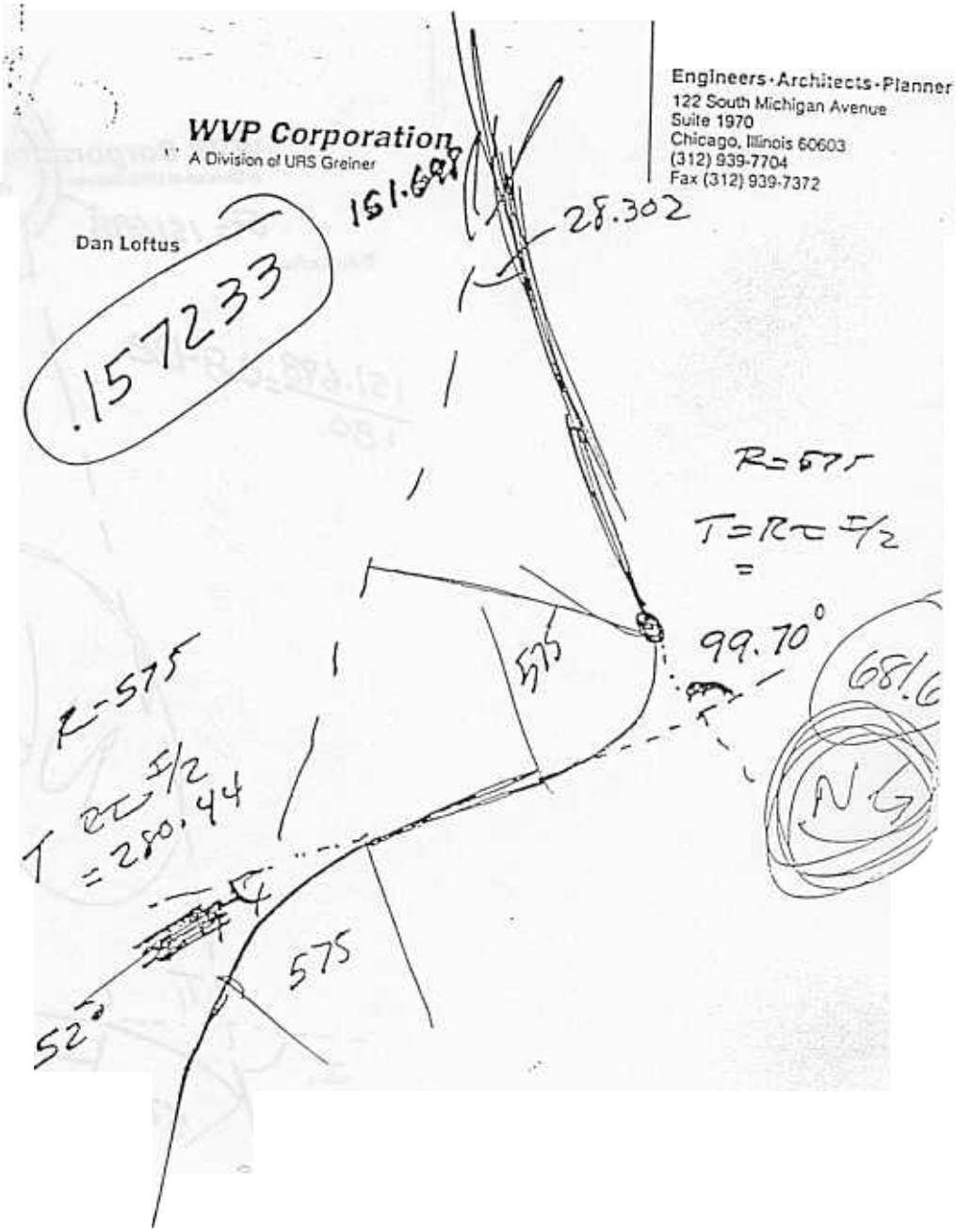

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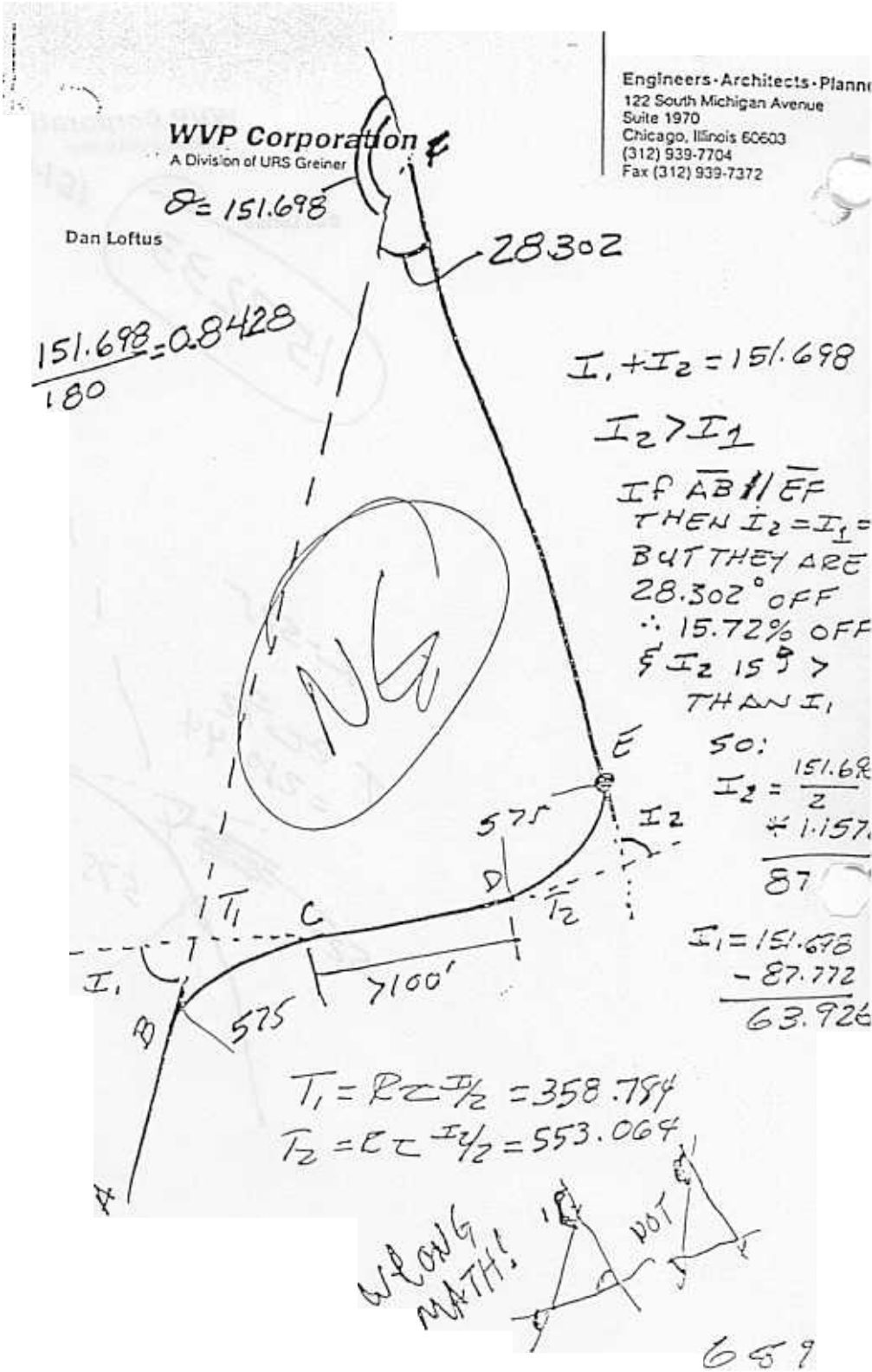

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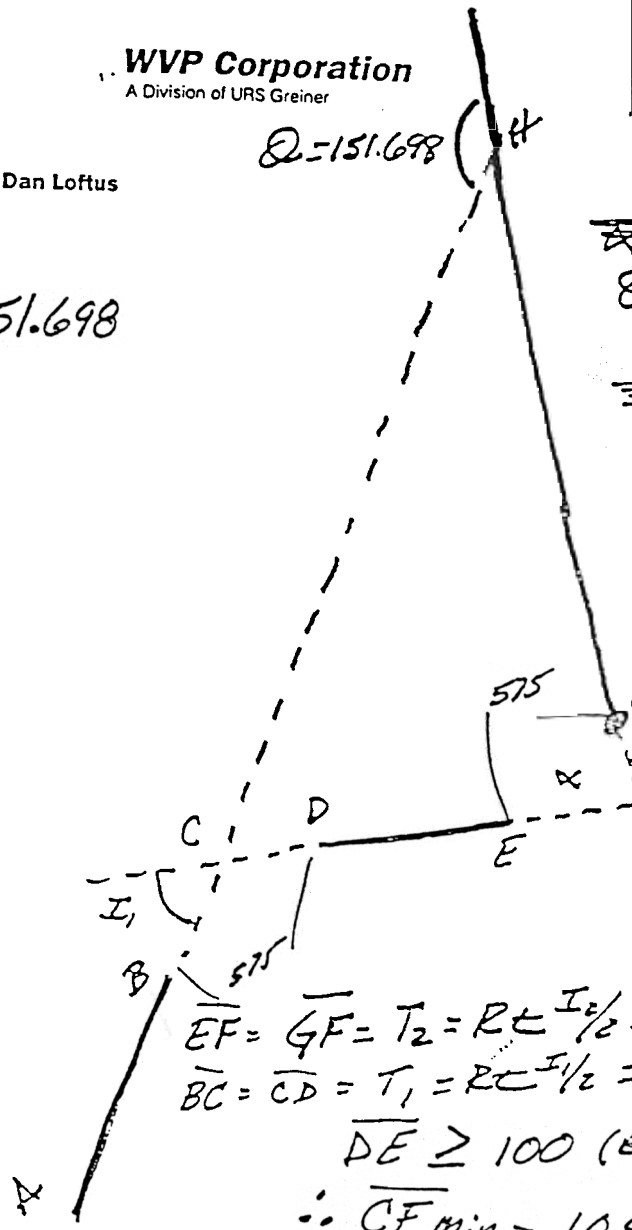

$I_1 = \alpha$ if // but 15.72% off

$\Theta = I_1 + (180 - I_2)$ tx

$I_1 = \frac{\Theta}{2}(0.8428)$

$= 63.926°$

$\therefore \alpha = 87.772$

and $I_2 = 92.22$

$\overline{EF} = \overline{GF} = T_2 = R \tan I_2/2 = 597.806$

$\overline{BC} = \overline{CD} = T_1 = R \tan I_1/2 = 358.784$

$\overline{DE} \geq 100$ (By definition)

$\therefore \overline{CF}_{min} = 1056.59'$

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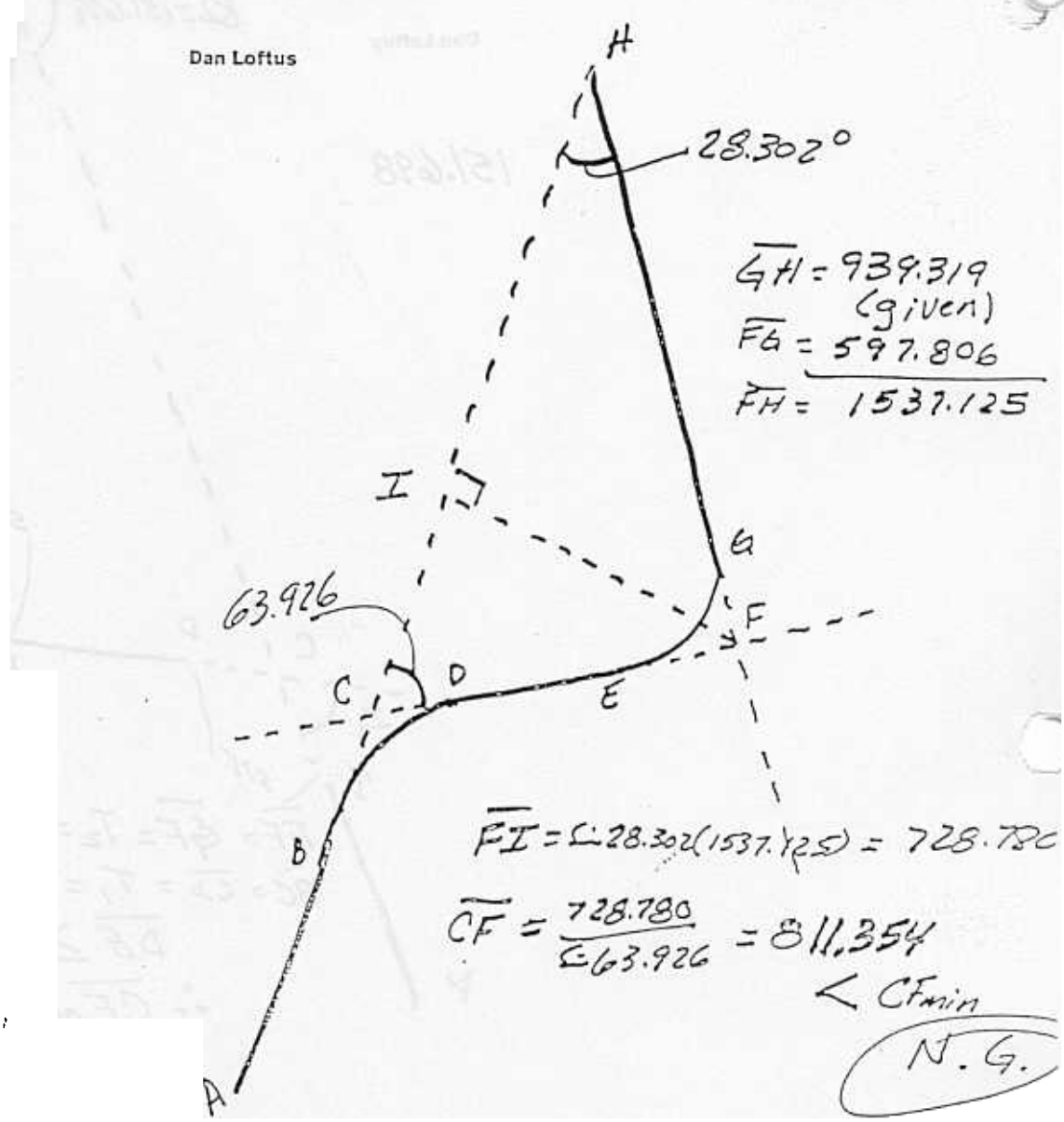

$\overline{GH} = 939.319$ (given)

$\overline{FG} = 597.806$

$\overline{FH} = 1537.125$

$\overline{FI} = \sin 28.302 (1537.125) = 728.780$

$\overline{CF} = \frac{728.780}{\sin 63.926} = 811.354$

$< CF_{min}$

N.G.

8 89

15.72% split assumption o/ N.G.

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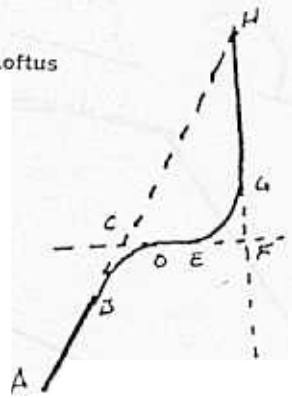


$\overline{CF} = T_1 + T_2 + 100$

$= (R \tan I_1) + R \tan I_2) + 100$

CONCLUSION:

AN ITERATIVE MATHMATECAL SOLUTION COULD BE MADE BY HAND, BUT GIVEN THE NUMBER OF UNKNOWNS A DIRECT SOLUTION YIELDING A 100.00 FOOT TANGENT ($\overline{DE}$) IS NOT POSSIBLE. FURTHER CALCULATIONS WILL BE MADE USING COMPUTER SPREADSHEET OR GEOPAK COGO.

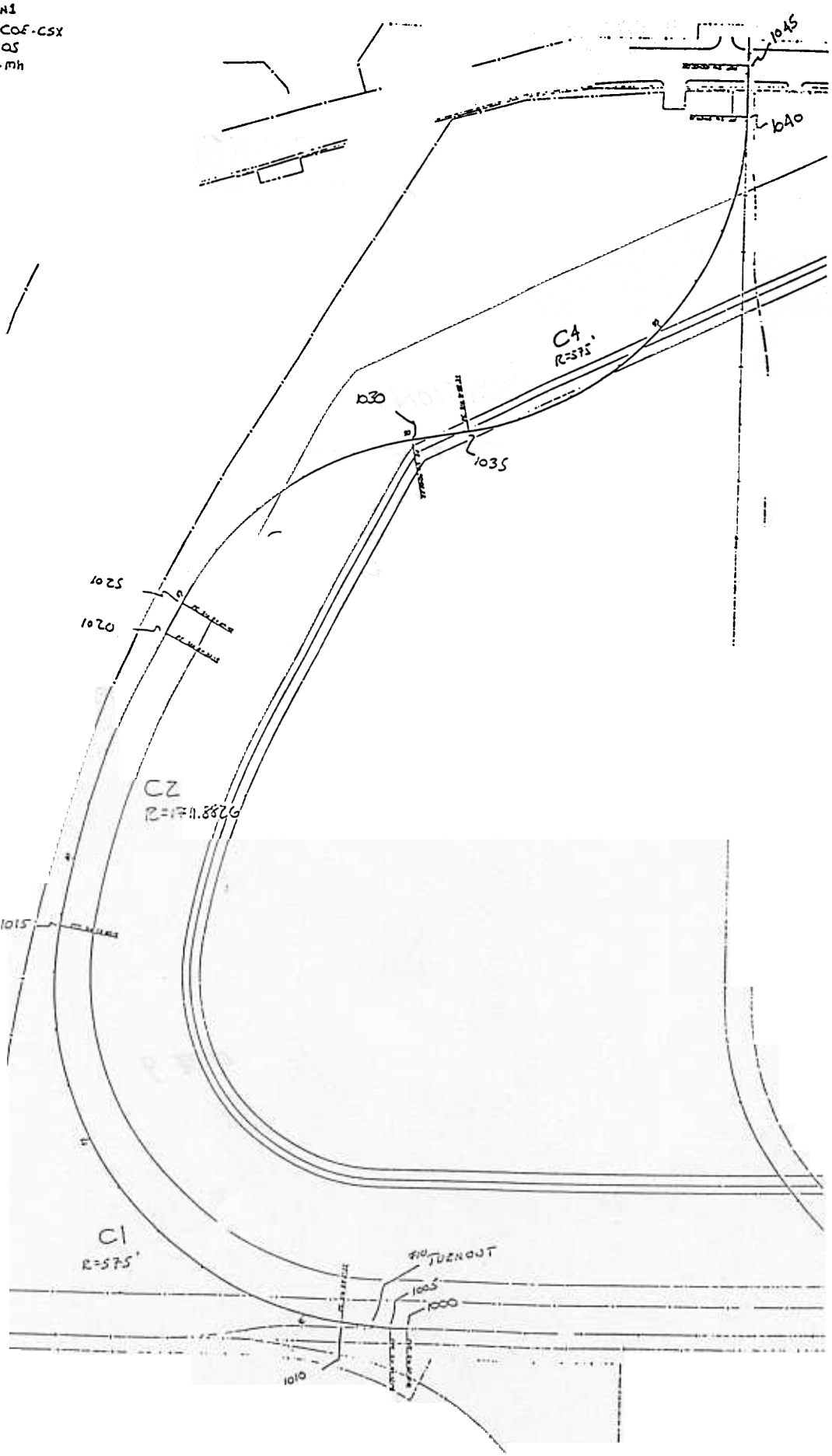
05CC053477.19

WTH 1-18-99

FILE: 053S477.19\cogolaligned

COGO:

CHAIN1
JOB= COG-CSX
JOB#=05
OPCOG=mh



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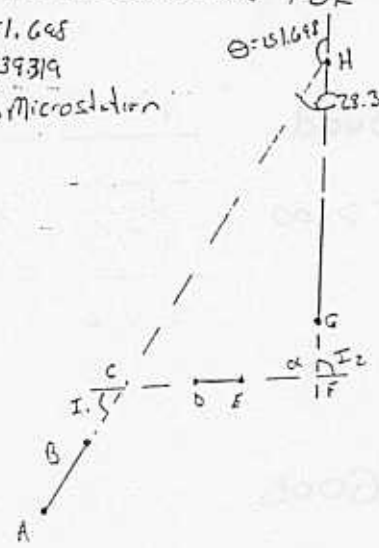
Job COE/CSX | Page 1 of 3
Description Track Relocation Alignment | Project No. 05-00035477.19 | Sheet ___ of ___
Computed by MTH | Date 1-12-99
Checked by ___ | Date ___
Reference

TRIAL & ERROR FOR CURVES #1 & #2 R = 575'

GIVEN: $\theta = 151.698$
$\overline{GH} = 939319$
Measured in Microstation



$\theta = I_1 + (180 - I_2)$
α

$\overline{EF} = \overline{GF} = T_2 = R \tan I_2/2$
$\overline{BC} = \overline{CD} = T_1 = T \tan I_1/2$

** $\overline{DE} = 100$ = Min tangent between the 2 curves (CSX standards) It also will maximize the area for the Combined disposal Facility

(1) Try: $I_2 = 95°$
$T_2 = 575 \tan 95/2 = 627.502$
$\alpha = 85$

NO GOOD
$\overline{DE} < 100$

$I_1 = \theta - 180 + I_2 = 66.698 = I_1$
$T_1 = 378.409$

---

(2) Try $I_2 = 80°$
$T_2 = 482.482$
$\alpha = 100$

NO GOOD
$\overline{DE} > 100$

$I_1 = 51.698$
$T_1 = 278.573$

---

(3) Try $I_2 = 75°$
$T_2 = 575 \tan I_2/2 = 441.213 = T_2$
$\alpha = 105°$

NO GOOD
$\overline{DE} > 100$

$I_1 = 16.698$
$T_1 = 218.217$

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Job CONRAIL/CSX — Project No. — Page ___ of ___

Description CURVES 1 & 2 — Computed by MTH — Sheet ___ of ___

Checked by — Date 1-14-9[illegible]

Reference

TRY $I_2 = 79.5°$

$T_2 = 478.222$

$\alpha = 100.5$

$I_1 = 51.198$

$T_1 = 275.481$

No Good

$\Delta E > 100$

TRY $I_2 = 79.8$

$T_2 = 480.775$

$\alpha = 100.2$

$I_1 = 51.498$

$T_1 = 277.335$

NO GOOD

$102.36 = \Delta E > 100$

TRY $I_2 = 80.5$

$T_2 = 486.773$

$\alpha = 99.5$

$I_1 = 52.198$

$T_1 = 281.677$

NO GOOD

$\Delta E < 100$ by 12.693

TRY $I_2 = 79.9$

$T_2 = 481.628$

$\alpha = 100.1$

$I_1 = 51.558$

$T_1 = 277.953$

Yes

$\Delta E = 100.118 \approx 100$. GOOD

URS Greiner Woodward Clyde

Job COE/CSX | Project No. | Page ___ of ___

Description HORIZONTAL ALIGNMENT FOR CURVES 3 & 4 | Computed by MJH | Date 1-14-99

Checked by | Date

Reference

CONCLUSION:

IN ORDER TO MAXIMIZE THE AMOUNT OF SPACE AVAILABLE FOR THE CONFINED DISPOSAL FACILITY, A TRIAL & ERROR METHOD WAS USED TO DESIGN CURVES 3 & 4. THE SOLUTION THAT MAXIMIZES THE AREA IS ONE THAT HAS A 100' TANGENT BETWEEN THE TWO 575' (MIN RAD.) CURVES (3 & 4). THIS WAS OBTAINED USING AN INFLUENCE ANGLE, $I_3 = 79.9°$, FOR CURVE 4 & AN INFLUENCE ANGLE, $I_4 = 51.598°$ FOR CURVE 3. THE TANGENT BETWEEN THE CURVES IS 100.118'

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Page ____ of ____

Job COE/CSX | Project No. ____ | Sheet ____ of ____

Description HORIZONTAL ALIGNMENT FOR CURVES 1 & 2 | Computed by MTH | Date 1-13-99

Checked by ____ | Date ____

Reference

MODIFY ARC ANGLE (CURVES 1 & 2)

TRIAL 1

$\alpha = 87.4879$

$I = 92.5121$

~~$T = 575 \tan I/2 \quad 600 \quad 780$~~ NO GOOD

Minimum $T = 602.0551$

TRIAL 2

$\alpha = 87.1627$

$I = 92.8373$

$I/2 = 46.419$

NO

TRIAL #3

$\alpha = 85.7978$

$I = 94.2022$

$I/2 = 47.1011$

$T = 618.798$

TRIAL #4

$\alpha = 85.4217$

$I = 94.5783$

$I/2 = 47.289$

$T = 622.585$

$R = T / \tan I/2 = 565.009 \Rightarrow R = 600$ min. (T = 617.619)

NO GOOD

URS Greiner Woodward Clyde

Job COE/CSX
Description HORIZ ALIGNMENT FOR CURVES 1 & 2

Project No.
Computed by MJH
Checked by

Page of
Sheet of
Date 1-13-99
Date
Reference

TRIAL #5

α 84.7255
95 2745
I/2 7.6037
Measured T 619.724
R T/tan I/2 365 47 ⇒ too S 11

NO GOOD

TRIAL #6

82.2926
I 7.7074
I/2 4 8 5537
Meas 618.6045
R

NO GOOD

(New location for TURNOUT #10)

TRIAL #7

α 291
I 9 7087
tan I/2 4447
575 tan I/2 & 757
Measured T 6 1398
R 610 80

TRIAL #8

URS Greiner Woodward Clyde

Job COZ/CSX | Project No. | Page ___ of ___

Description HORIZ. ALIGNMENT FOR CURVES 1&2 | Computed by MTH | Sheet ___ of ___

Checked by | Date 11-13-[illegible]

Reference

MUST USE TRIAL & ERROR METHOD GRAPHICALLY IN MICROSTATION IN ORDER TO GET CURVE #1 TO MEET the #10 TURNOUT

CONCLUSION

THE SOLUTION FOR THE ALIGNMENT FOR CURVES 1 & 2 WAS OBTAINED GRAPHICALLY IN MICROSTATION BY MODIFYING THE ARC ANGLE OF CURVE 2 (GIVEN TO US BY COZ) SO THAT A 575' RAD. CURVE #1 COULD MEET A #10 TURNOUT WHERE THE RELOCATION MATCHES BACK IN TO EXISTING RAIL.

URS Greiner Woodward Clyde

Job COE/CSX — Project No. — Page ____ of ____

Description VERTICAL CURVE NOTES — Computed by MTH — Sheet ____ of ____

Checked by — Date 1/19/96 — Date ____

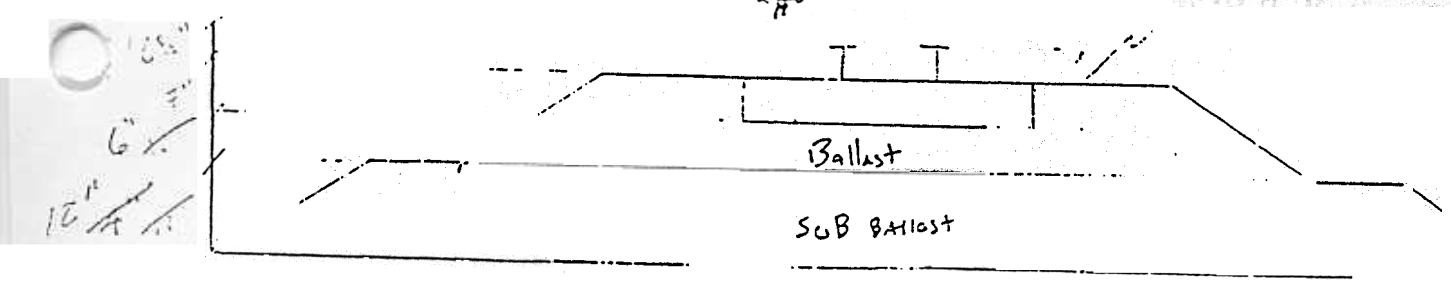
Reference

CSX STANDARDS SPECS.

115#

31.625" = 2.63542'

~~25.625" = 1.96875'~~



31.625"

~~23.625"~~

* Design Proposed vertical profile to be approx 57.625" above existing profile in order to minimize Cuts & fills.

GEOPAK

Project: coe-csx
Subject: alignment
Job No. 05 Operator: NH
Date: Wednesday January 20, 1999 11:07 am
SYSTEM FIX 4 ASEC 2 BEAR PRI 0 NOR NE STA 2 FILE: 'CHAIN'

Is this latest & most current print-out? Does not match Data on plans. 4/22/99

Describe Chain CHAIN1

Chain CHAIN1 contains:
1000 1005 CUR C1 CUR C2 CUR C3 CUR C4 1045

Beginning chain CHAIN1 description

Point 1000 N 1,513,722.6010 E 389,157.8190 Sta 68+10.81

Course from 1000 to 1005 N 0° 22' 26.48" E Dist 31.2507

Point 1005 N 1,513,753.8510 E 389,158.0230 Sta 68+42.06

Course from 1005 to PC C1 N 6° 00' 52.95" E Dist 85.7099

Curve Data

Curve C1

P.I. Station	75+54.21	N 1,514,462.0798	E	389,232.6434
Delta =	94° 54' 11.54" (RT)			
Degree =	9° 57' 52.14"			
Tangent =	626.4392			
Length =	952.4147			
Radius =	575.0000			
External =	275.3241			
Long Chord =	847.2124			
Mid. Ord. =	186.1777			
P.C. Station	69+27.77	N 1,513,839.0890	E	389, 7.0040
P.T. Station	78+80.19	N 1,514,343.4320	E	389, 7.7440
C.C.		N 1,513,778.8395	E	389,..8.8363
Back = N	6° 00' 52.52" E			
Ahead = S	79° 04' 55.94" E			
Chord Bear = N	53° 27' 58.29" E			

Curve Data

Curve C2

P.I. Station	81+57.71	N 1,514,290.8692	E	390,120.2438
Delta =	18° 25' 00.71" (RT)			
Degree =	3° 20' 49.00"			
Tangent =	277.5230			
Length =	550.2588			
Radius =	1,711.8826			
External =	22.3495			
Long Chord =	547.8530			
Mid. Ord. =	22.0615			
P.C. Station	78+80.19	N 1,514,343.4320	E	389,847.7440
P.T. Station	84+30.44	N 1,514,154.9080	E	390,362.1810
C.C.		N 1,512,662.5344	E	389,523.5135
Back = S	79° 04' 56.03" E			
Ahead = S	60° 39' 55.33" E			
Chord Bear = S	69° 52' 25.68" E			

Course from PT C2 to PC C3 S 60° 41' 51.80" E Dist 58.9599

Curve Data

Curve C3

P.I. Station	87+67.35	N	1,513,990.0186	E	390,655.9835
Delta =	51° 35' 50.88" (RT)				
D =	9° 57' 52.14"				
Tangent =	277.9502				
Length =	517.8138				
Radius =	575.0000				
External =	63.6559				
Long Chord =	500.4929				
Mid. Ord. =	57.3112				
P.C. Station	84+89.40	N	1,514,126.0520	E	390,413.5970
P.T. Station	90+07.22	N	1,513,715.5670	E	390,699.9450
P.C.		N	1,513,624.6231	E	390,132.1825
Back = S 60° 41' 51.96" E					
Ahead = S 9° 06' 01.08" E					
Chord Bear = S 34° 53' 56.52" E					

Course from PT C3 to PC C4 S 9° 06' 03.81" E Dist 100.1225

Curve Data

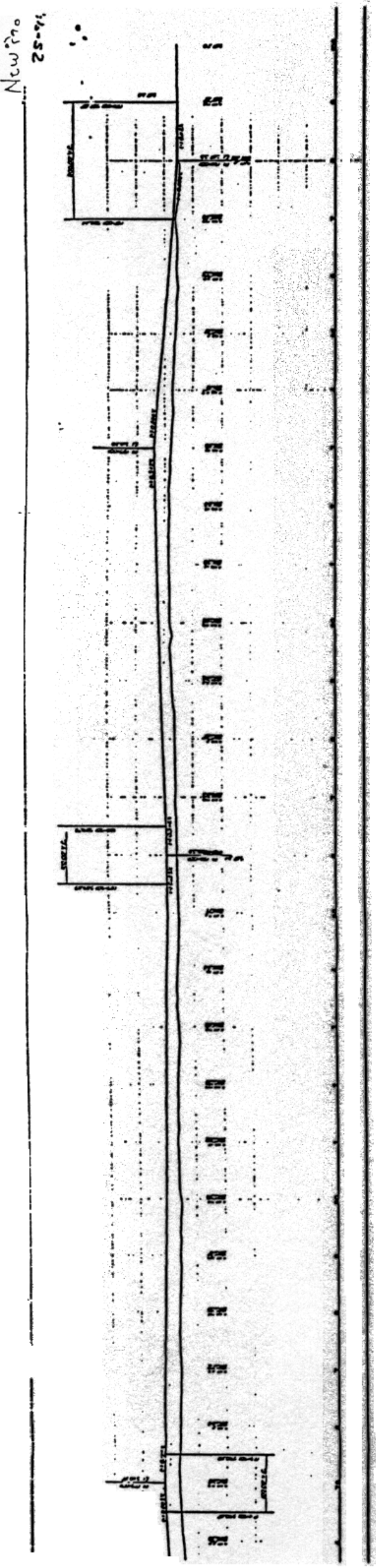
Curve C4

P.I. Station	95+88.97	N	1,513,141.1403	E	390,791.9591
Delta =	79° 53' 59.74" (LT)				
Degree =	9° 57' 52.14"				
Tangent =	481.6272				
Length =	801.8472				
Radius =	575.0000				
External =	175.0598				
Long Chord =	738.4361				
Mid. Ord. =	134.2018				
P.C. Station	91+07.34	N	1,513,616.7050	E	390,715.7820
P.T. Station	99+09.19	N	1,513,132.7280	E	391,273.5130
P.T.		N	1,513,707.6505	E	391,283.5442
Back = S 9° 06' 01.67" E					
Ahead = S 89° 00' 01.41" E					
Chord Bear = S 49° 03' 01.54" E					

Course from PT C4 to 1045 S 88° 59' 59.58" E Dist 90.8078

Point 1045 N 1,513,131.1530 E 391,364.3070 Sta 100+00.00

Ending chain CHAIN1 description

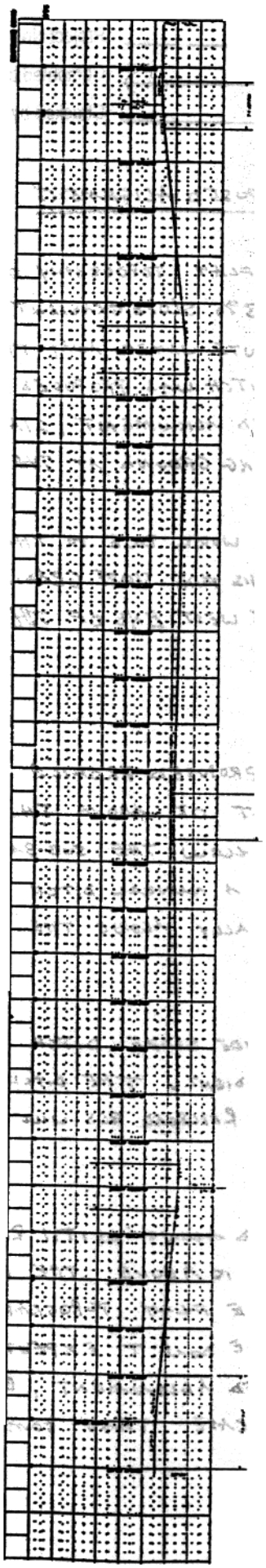


OLD PROFLE

EE NEXT PAGE

FOR N W PROFILE

NE PRO



URS Greiner Woodward Clyde

Page ____ of ____

Job COE/CSX | Project No. ____ | Sheet ____ of ____

Description DRAINAGE DITCH | Computed by MTH | Date 2-10-99

Checked by ____ | Date ____

Reference

See comment on plans regarding drainage ditch(es)

DRAINAGE DITCH ALONG PROPOSED ALIGNMENT

DUE TO THE VERY FLAT TOPOGRAPHY OF THE ~~SIDE A DITCH WITH~~ 3:1 SIDE SLOPES, 0.3% SLOPE GRADIENT & A 1 FOOT MINIMUM DEPTH WAS PROPOSED TO ROUTE WATER AWAY FROM THE PROPOSED RAILROAD ALIGNMENT. THE DITCH WAS PROPOSED TO RUN ALONG THE SOUTH SIDE OF THE PROPOSED ALIGNMENT, STARTING AT THE EAST END AND MATCHING EXISTING GROUND AT THE WEST END.

THIS DID NOT WORK DUE TO THE EXTREMELY FLAT TOPOGRAPHY. A DITCH WITH THIS MIN. SLOPE GRADIENT WOULD NOT MATCH EXISTING AT THE WEST END OF THE PROPOSED ~~A~~ ALIGNMENT.

SOLUTION:

① RAISE THE PROPOSED PROFILE SO THAT THE TYPICAL SECTION IS AT OR ABOVE THE EXISTING GROUND LINE. THIS WOULD ALLOW THE SUB-BALLAST TO ACT AS THE SIDE SLOPE OF A NATURAL DITCH & THE WATER WOULD FLOW NATURALLY ALONG THE PROPOSED ALIGNMENT

② USE A 3:1 SIDE SLOPE DITCH WITH A 2 FOOT DEPTH & NO SLOPE GRADIENT. THE DITCH WILL CATCH ANY RUNOFF SO THAT THE RAILROAD BED WILL NOT BE AFFECTED.

* SOLUTION ② WAS USED ALONG WITH RAISING THE PROFILE SO THAT THE ENTIRE TYP. SECT. IS ABOVE THE EXISTING GROUND LINE. ~~THIS~~ BECAUSE OF THE FLAT TOPOGRAPHY & THE SANDY SOILS (BORING LOGS) ~~THIS~~ WE DON'T EXPECT MUCH RUNOFF IN THE AREA OF THE PROPOSED ALIGNMENT, BUT THE DITCH IS A SAFEGUARD IN THE CASE THAT SOME RUNOFF OCCURS.

Table F - 1 Railroad Relocation Material Quantities

Item	Unit	Contractor	Railroad	Total Quantity
Track Complete in Place	LINEAR FEET	2,798	183	2,981
Ballast	TONS	1,628	104	1,732
Sub-Ballast	TONS	6,029	692	6,721
Earth Excavation	CUBIC YARDS	4,926	0	4,926
Embankment	CUBIC YARDS	0	0	0
Concrete Removal	SQUARE YARDS	476	0	476
Furnishing and Placing Topsoil and Seeding	SQUARE YARDS	15,260	0	15,260
Track to be Removed	LINEAR FEET	5,321	0	5,321
Topsoil to be Stripped	SQUARE YARDS	21,662	0	21,662
Clay Cap	CUBIC YARDS	18,720	0	18,720
#10 Turnout	EACH	Q	1	1
Silt Filter Fence	FOOT	4,080	0	4,080

URS Greiner Woodward Clyde

Job COE/CSX Project No. _____ Page ____ of ____

Description PROFILE & CROSS SECTION CHANGES FOR BACKCHECK SUBMITTAL PER 100% COMMENTS Computed by MTH Date 5/17/99

Checked by _____ Date _____

Reference

- PROFILE WAS RAISED 2' TO ALLOW FOR A 2' RCRA CAP TO BE PLACED THROUGHOUT THE 60' R.R. EASEMENT. THE NEW QUANTITIES ARE SHOWN ON THE FOLLOWING PAGE

- CROSS SECTIONS WERE RECUT @ 5' IN BOTH THE VERTICAL & THE HORIZONTAL. TOPSOIL, STRIPPING, & RCRA CAP SHOWN IN ALL CROSS SECTIONS

THE DITCH WAS CHANGED FROM A 1' BOTTOM TO A 3' BOTTOM FOR CONSTRUCTABILITY

COE/CSX TRANSPORTATION TRACK RELOCATION
AT THE INDIANA HARBOR CONFINED DISPOSAL FACILITY

Project #: 0500035477.19
Computed by: MTH
July 14, 1999

SUMMARY OF QUANTITIES

ITEM	UNIT	TOTAL QUANTITIES	CONTRACTOR	RAILROAD
TRACK COMPLETE IN PLACE	L.F	2981	2798	183
BALLAST	TONS	1732	1628	104
SUB-BALLAST	TONS	6721	6029	692
EARTH EXCAVATION	CU. YD.	4926	4926	0
EMBANKMENT	CU. YD.	0	0	0
CONCRETE REMOVAL	SQ. YD	476	476	0
FURNISHING AND PLACING TOPSOIL AND SEEDING	SQ. YD	15260	15260	0
TRACK TO BE REMOVED	L.F.	5321	5321	0
TOPSOIL STRIPPING	SQ. YD.	21662	21662	0
CLAY CAP	CU. YD.	18720	18720	0
#10 TURNOUT	EACH	1	0	1
SILT FILTER FENCE	FOOT	4080	4080	0

COE/CSX TRANSPORTATION TRACK RELOCATION
AT THE INDIANA HARBOR CONFINED DISPOSAL FACILITY

PROJECT #: 0500035477.19
DESCRIPTION: CUT AND FILL QUANTITIES
COMPUTED BY: MTH
DATE: May 21, 1999

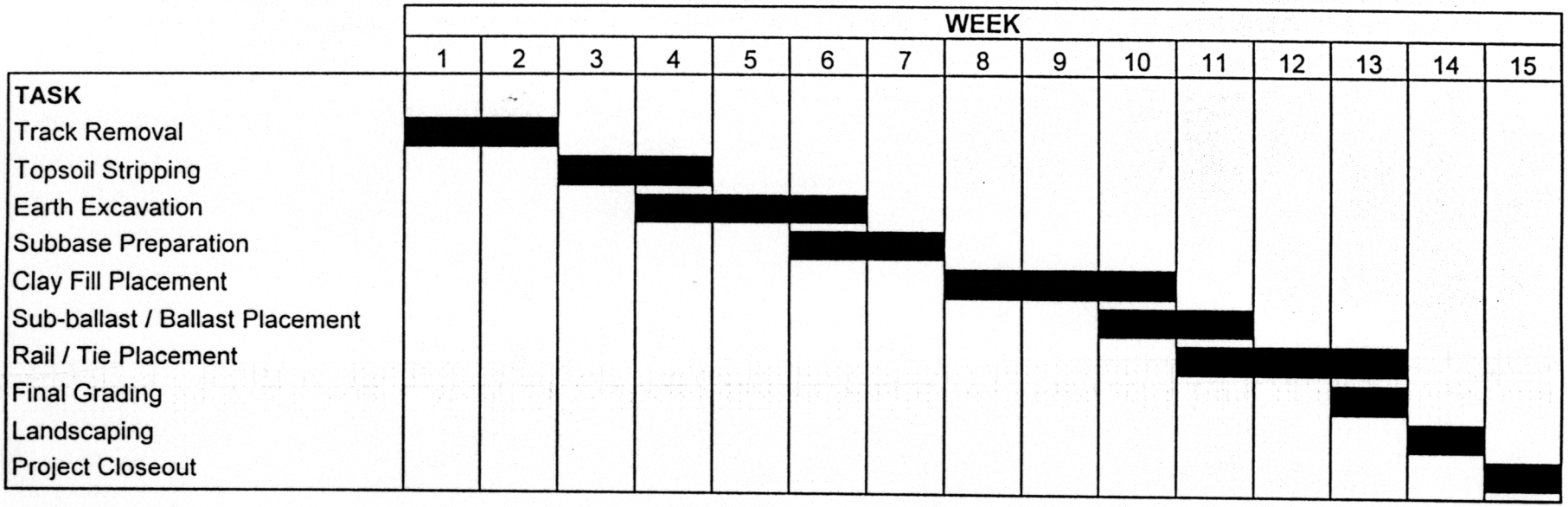
AVG VOLUME (cy) = [D(A1+A2)/2]/27
A1=AREA1 (sf)
A2=AREA2 (sf)
D=DISTANCE BETWEEN AREAS

EE=EARTH EXCAVATION
FE=PROPOSED EMBANKMENT
SB=PROPOSED SUB-BALLAST
B=PROPOSED BALLAST

STA	EE (sf)	EMB (sf)	SB (sf)	B (sf)	VOL EE (cy)	VOL EMB (cy)	VOL SB (cy)	VOL B (cy)
6810.81	0.0	0.0	0.0	0.0				
6900	48.1	0.0	13.1	4.7	79.4	0.0	21.6	7.7
7000	60.0	0.0	22.0	7.7	200.1	0.0	0.0	22.9
7100	96.7	0.0	22.0	7.7	290.2	0.0	81.5	28.5
7200	7.3	0.0	23.1	7.7	192.6	0.0	83.5	28.5
7300	7.1	0.0	43.4	7.7	26.7	0.0	123.1	28.5
7400	6.9	0.0	60.5	7.7	26.0	0.0	192.4	28.5
7500	6.9	0.0	82.7	7.7	25.6	0.0	265.1	28.5
7600	7.0	0.0	86.0	7.7	25.7	0.0	312.3	28.5
7700	7.0	0.0	82.9	7.7	25.9	0.0	312.8	28.5
7800	6.5	0.0	76.7	7.7	25.0	0.0	295.6	28.5
7900	6.7	0.0	76.1	7.7	24.4	0.0	283.0	28.5
8000	7.7	0.0	73.8	7.7	26.7	0.0	277.6	28.5
8100	6.7	0.0	56.9	7.7	26.7	0.0	242.0	28.5
8200	6.7	0.0	55.2	7.7	24.8	0.0	209.4	28.5
8300	7.1	0.0	56.4	7.7	25.6	0.0	208.5	28.5
8400	6.9	0.0	46.8	7.7	25.9	0.0	191.1	28.5
8500	7.0	0.0	48.9	7.7	25.7	0.0	177.2	28.5
8600	7.0	0.0	51.0	7.7	25.9	0.0	185.0	28.5
8700	7.6	0.0	50.0	7.7	27.0	0.0	187.0	28.5
8800	6.8	0.0	57.1	7.7	26.7	0.0	198.3	28.5
8900	7.2	0.0	48.8	7.7	25.9	0.0	196.1	28.5
9000	6.6	0.0	45.7	7.7	25.6	0.0	175.0	28.5
9100	6.9	0.0	48.8	7.7	25.0	0.0	175.0	28.5
9200	7.3	0.0	52.9	7.7	26.3	0.0	188.3	28.5
9300	5.8	0.0	52.2	7.7	24.3	0.0	213.1	28.5
9400	6.1	0.0	42.0	7.7	22.0	0.0	193.0	28.5
9500	138.9	0.0	67.9	7.7	268.5	0.0	203.5	28.5
9600	147.7	0.0	37.3	7.7	530.8	0.0	194.8	28.5
9700	190.8	0.0	22.0	7.7	626.9	0.0	109.8	28.5
9800	224.2	0.0	22.0	7.7	768.4	0.0	81.5	28.5
9909.19	0.0	0.0	0.0	0.0	453.2	0.0	44.5	15.5
					3973.6	0.0	5521.9	844.6

TOTAL EARTH EXCAVATION: 3974 cy
TOTAL EMBANKMENT: 0 cy
TOTAL SUB-BALLAST: 5522 cy
TOTAL BALLAST: 845 cy

RO E FOR B EC TA 572 29



Prepared By:

URS Greiner Woodward Clyde

US Army Corps of Engineers
CSXT Track Relocation at the
Indiana Harbor CDF

Construction Sequence Schedule

ATTACHMENT 3

Local Sponsor's Concurrence with Preliminary Railroad Relocation Design

EAST CHICAGO
WATERWAY MANAGEMENT DISTRICT

VICE-PRESIDENT
EDWARDO MALDONADO

PRESIDENT
FRANK KOLLINTZAS

EXECUTIVE DIRECTOR
ADRIANE ESPARZA

ROBERT A. PASTRICK MARINA
3301 ALDIS AVENUE
EAST CHICAGO, IN
46312

June 10, 1999

Sterling Johnson, ED-DC
US Army Corps of Engineers
111 N. Canal Street, Suite 600
Chicago, IL 60606

Re: CSX Transportation Track Relocation at the Indiana Harbor Confined Disposal Facility

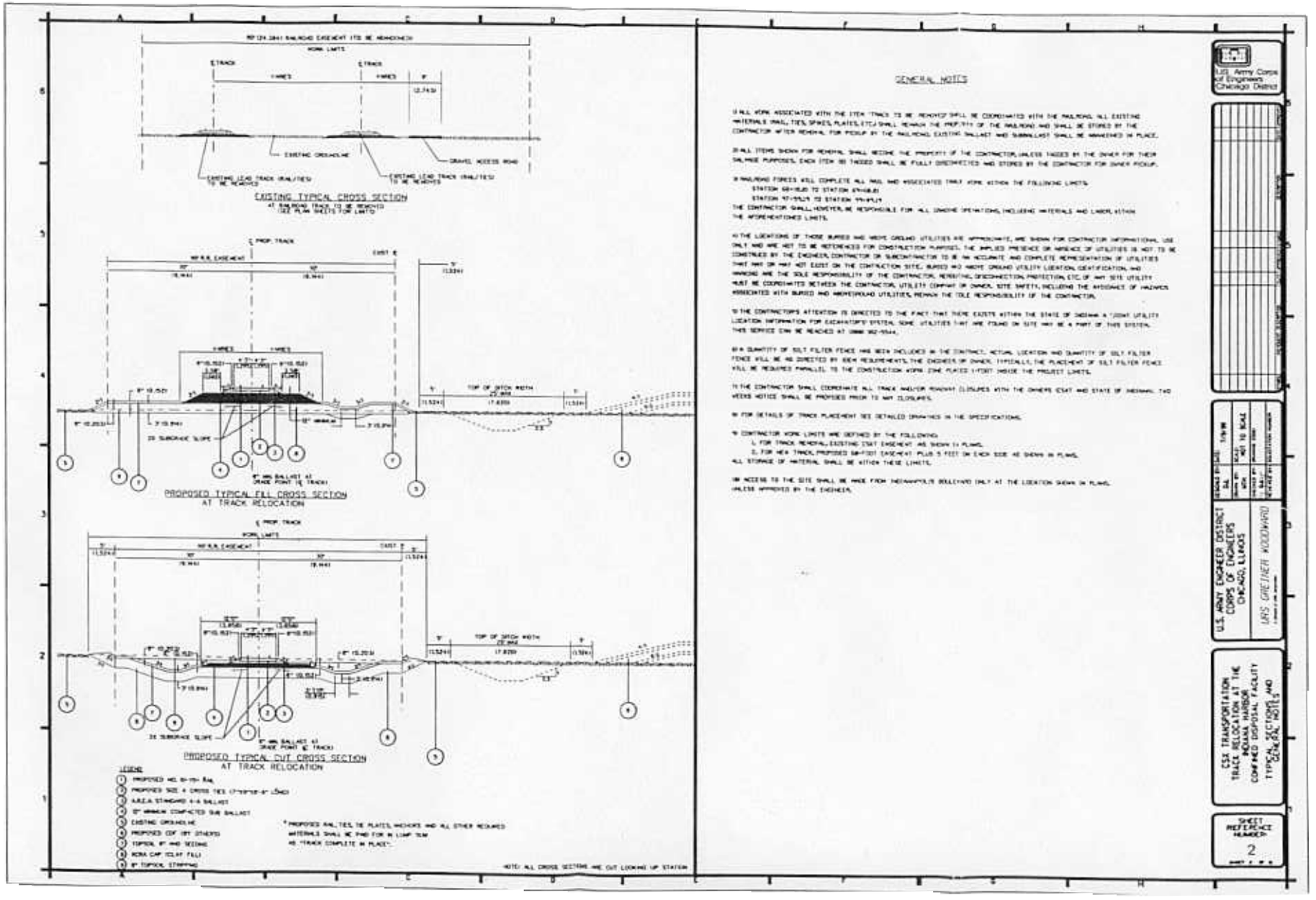
Dear Mr. Johnson:

The East Chicago Waterway Management District has reviewed the final design memorandum for the above project and has no additional comments.

Sincerely,

Adriane Esparza

AE/ae


EXISTING TYPICAL CROSS SECTION
AT RAILROAD TRACK TO BE REMOVED
SEE PLAN SHEETS FOR LIMITS
PROPOSED TYPICAL FILL CROSS SECTION
AT TRACK RELOCATION
PROPOSED TYPICAL CUT CROSS SECTION
AT TRACK RELOCATION
LEGEND
NOTE: ALL CROSS SECTIONS ARE CUT LOOKING UP STATION
GENERAL NOTES
U.S. Army Corps of Engineers Chicago District
U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS CHICAGO, ILLINOIS
LARS GRETHER WOODWARD
CSX TRANSPORTATION TRACK RELOCATION AT THE INDIANA HARBOR CONFINED DISPOSAL FACILITY
TYPICAL SECTIONS AND NOTES
SHEET REFERENCE NUMBER
2

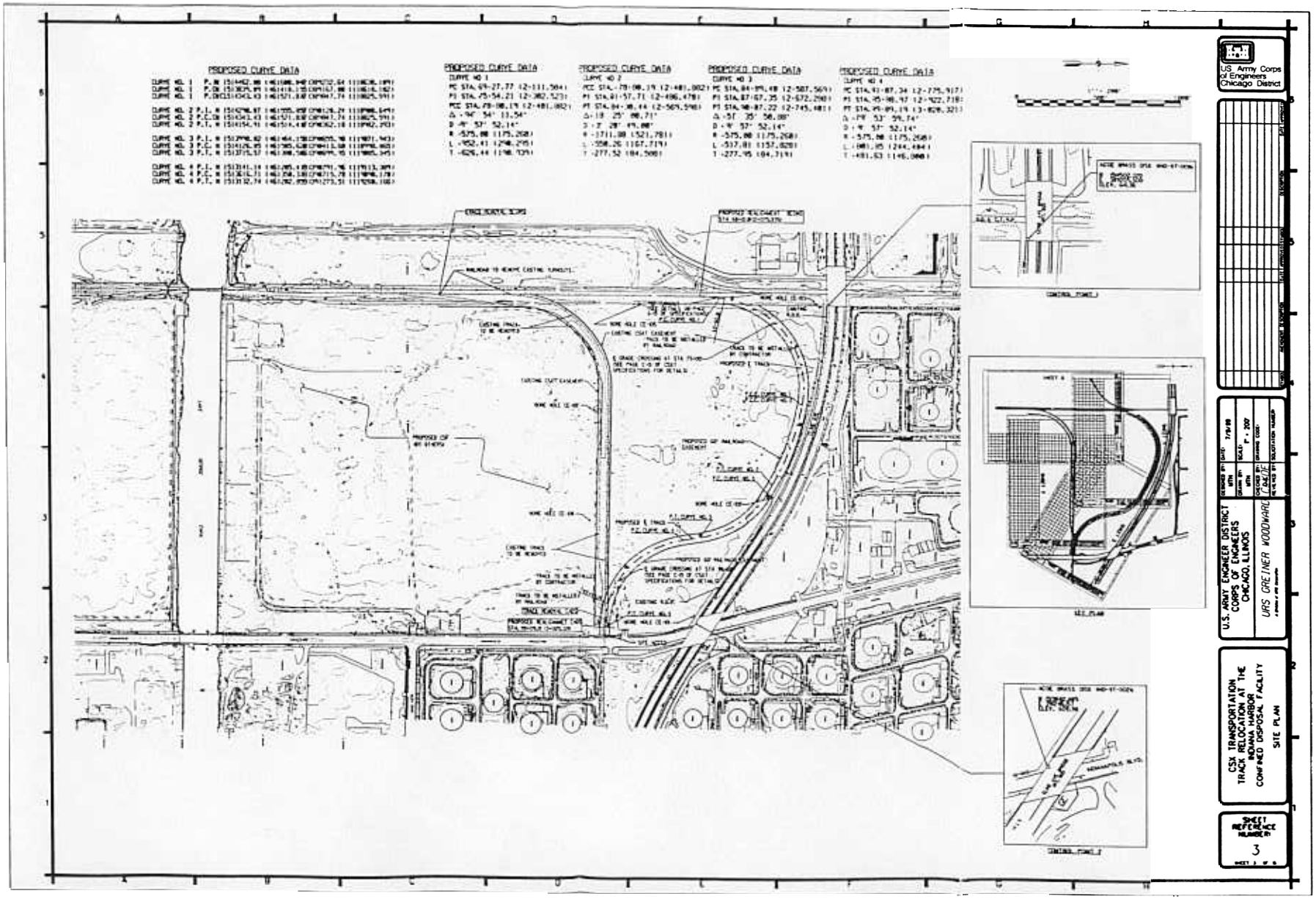
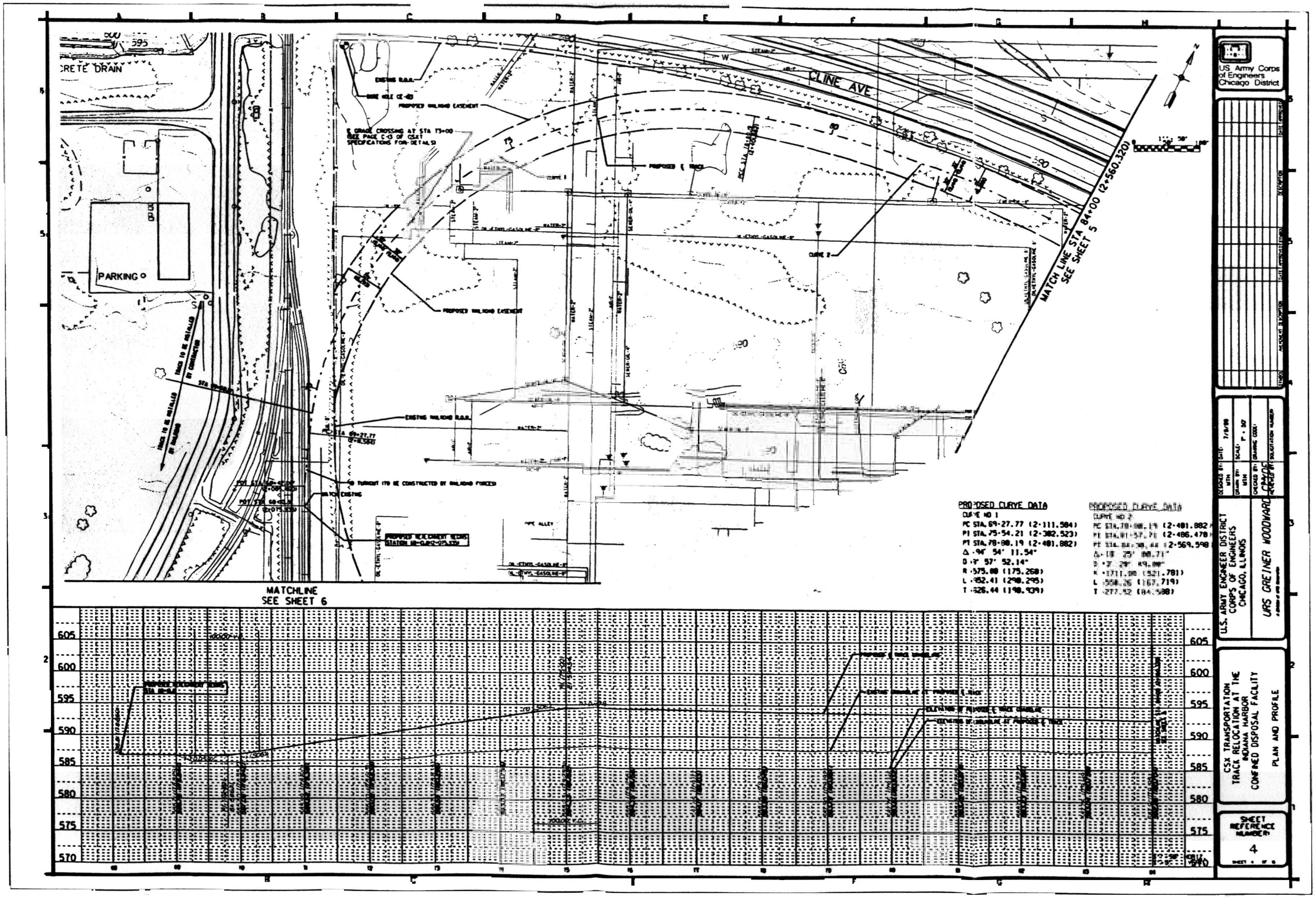
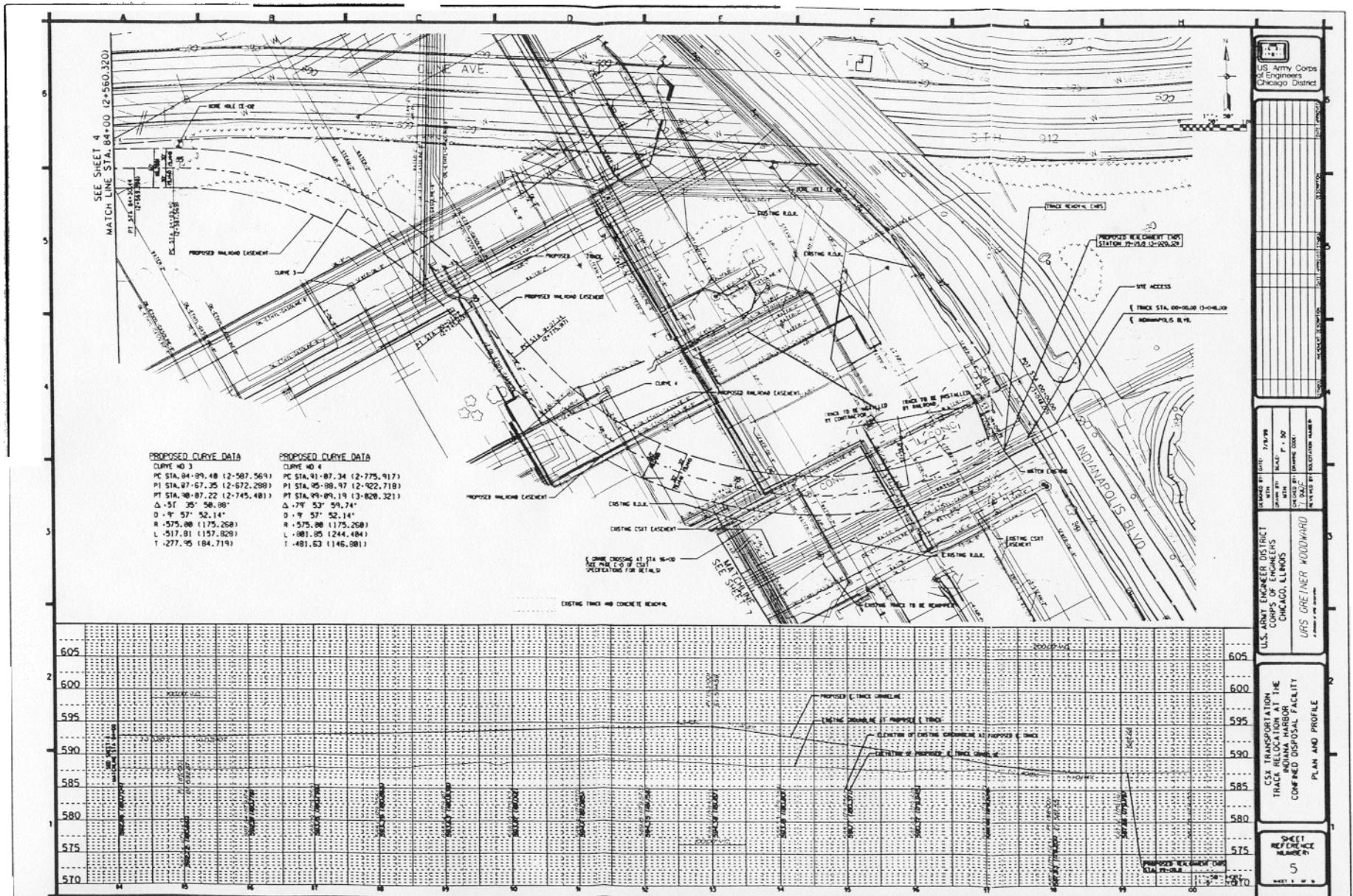

U.S. Army Corps of Engineers Chicago District
CSX TRANSPORTATION TRACK RELOCATION AT THE INDIANA HARBOR CONFINED DISPOSAL FACILITY
SITE PLAN
U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS CHICAGO, ILLINOIS
URS GREINER WOODWARD
SHEET REFERENCE NUMBER
3

PLATE F-2



CLINE AVE
PARKING
MATCHLINE
SEE SHEET 6
MATCH LINE STA 84+00 (2+560.320)
SEE SHEET 5
PROPOSED RAILROAD EASEMENT
PROPOSED CURVE DATA
CURVE NO 1
PC STA. 69+27.77 (2+111.584)
PI STA. 75+54.21 (2+302.523)
PT STA. 78+80.19 (2+401.882)
Δ 94° 54' 11.54"
D 3° 57' 52.14"
R 575.00 (175.260)
L 952.41 (290.295)
T 626.44 (190.939)
PROPOSED CURVE DATA
CURVE NO 2
PC STA. 78+80.19 (2+401.882)
PI (2+486.478)
PT (2+569.598)
R (521.781)
L (167.719)
US Army Corps of Engineers Chicago District
U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
CHICAGO, ILLINOIS
URS GREINER WOODWARD CLYDE
CSX TRANSPORTATION
TRACK RELOCATION AT THE
INDIANA HARBOR
CONFINED DISPOSAL FACILITY
PLAN AND PROFILE
SHEET REFERENCE NUMBER:
4
605
600
595
590
585
580
575
570

PLATE E-3



U.S. Army Corps of Engineers
Chicago District

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
CHICAGO, ILLINOIS

URS GREINER WOODWARD

CSX TRANSPORTATION
TRACK RELOCATION AT THE
INDIANA HARBOR
CONFINED DISPOSAL FACILITY

PLAN AND PROFILE

SHEET REFERENCE NUMBER
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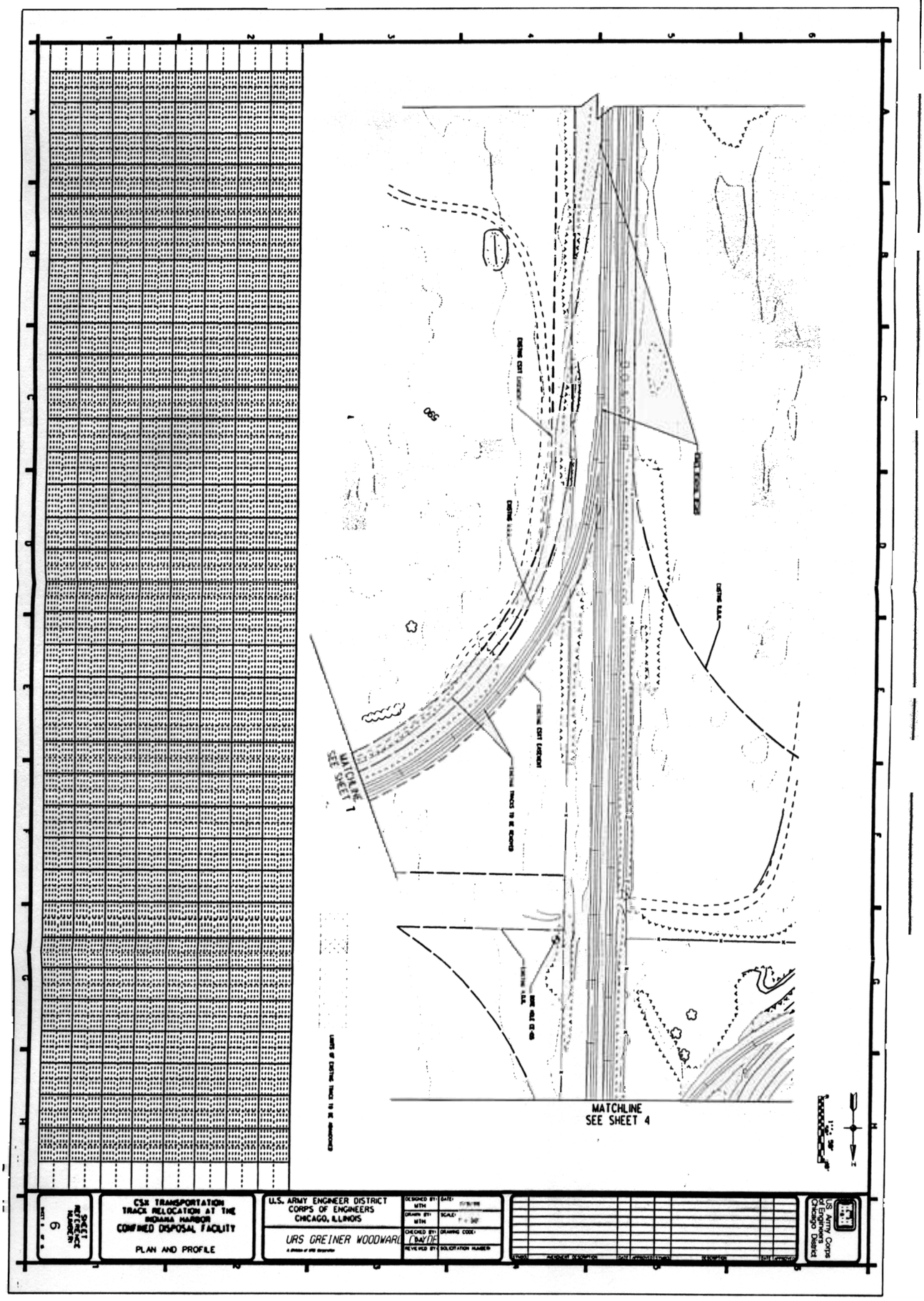


SHEET REFERENCE NUMBER
6
SHEET 6 OF 8

CSX TRANSPORTATION
TRACK RELOCATION AT THE
INDIANA HARBOR
CONFINED DISPOSAL FACILITY

PLAN AND PROFILE

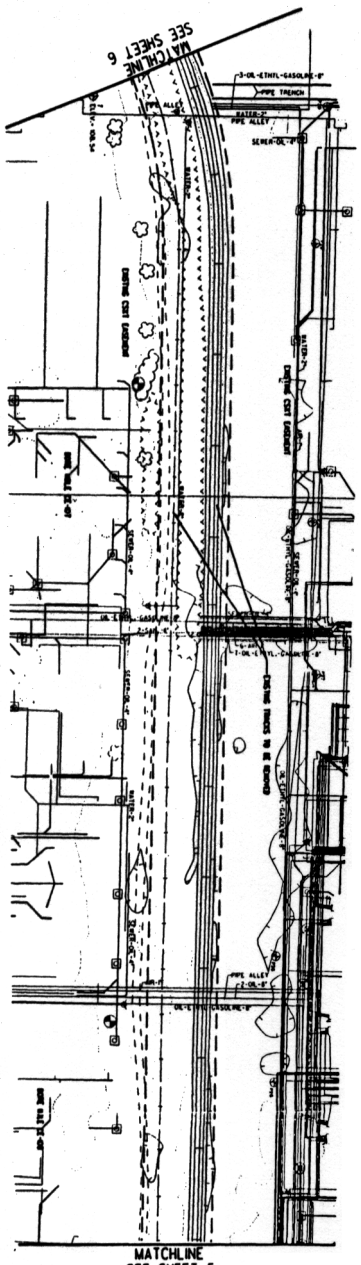
U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
CHICAGO, ILLINOIS

URS GREINER WOODWARD CLYDE

DESIGNED BY: MTH
DRAWN BY: MTH
CHECKED BY: (DAYDE
REVIEWED BY:
DATE:
SCALE:
DRAWING CODE:
SOLICITATION NUMBER:

NO. | REVISION DESCRIPTION | DRAFT CONSTRUCTION | DESCRIPTION | DATE CHANGED

US Army Corps of Engineers Chicago District



CSX TRANSPORTATION
TRACK RELOCATION AT THE
INDIANA HARBOR
CONFINED DISPOSAL FACILITY

PLAN AND PROFILE

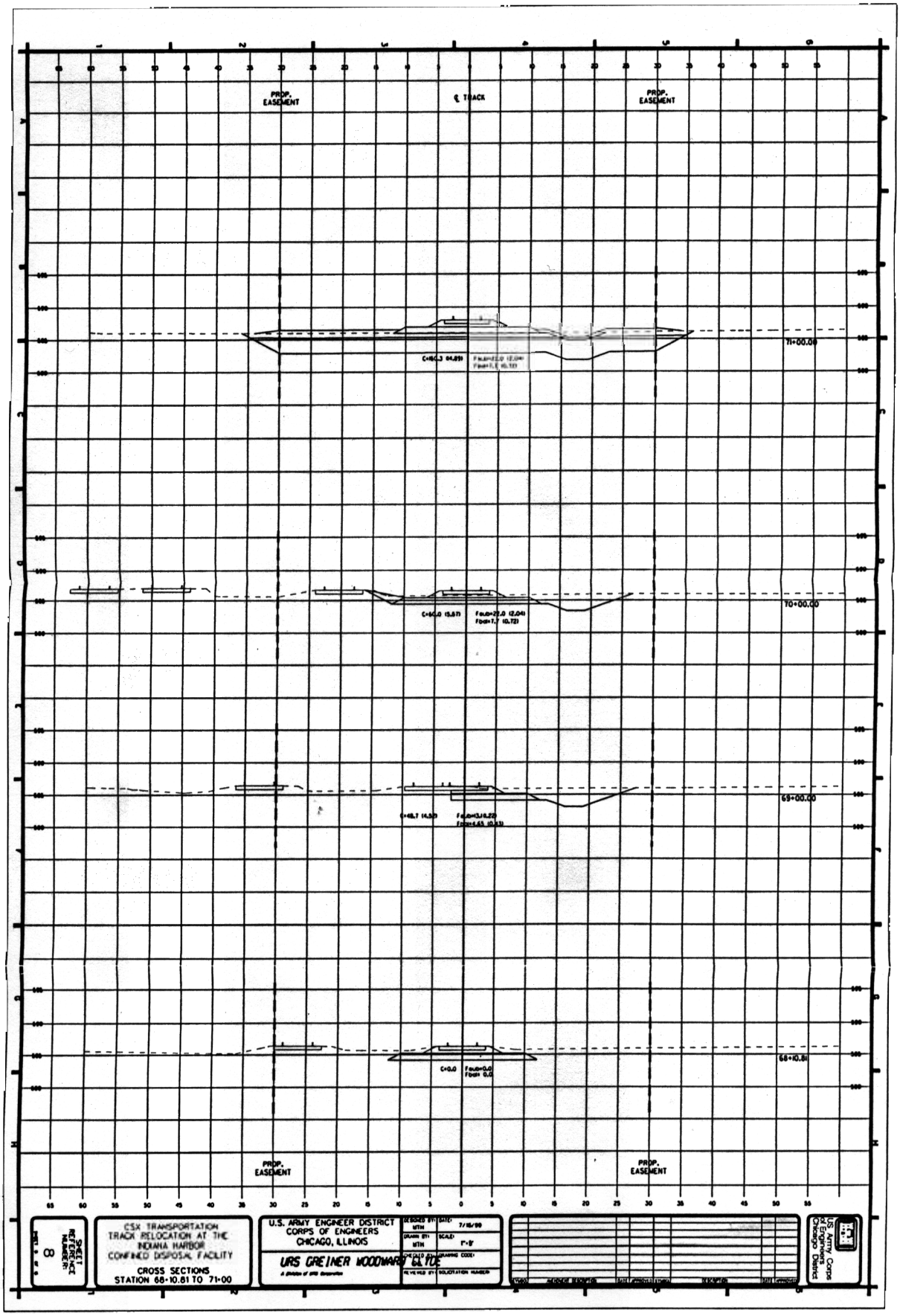
SHEET REFERENCE NUMBER 7

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
CHICAGO, ILLINOIS

URS GREINER WOODWARD CLYDE

DESIGNED BY: MTH
DRAWN BY: MTH
CHECKED BY:
REVIEWED BY:
DATE: 7/9/98
SCALE: 1" = 50'
DRAWING CODE:
SOLICITATION NUMBER:

US Army Corps of Engineers Chicago District



SHEET REFERENCE NUMBER 8

CSX TRANSPORTATION
TRACK RELOCATION AT THE
INDIANA HARBOR
CONFINED DISPOSAL FACILITY

CROSS SECTIONS
STATION 68+10.81 TO 71+00

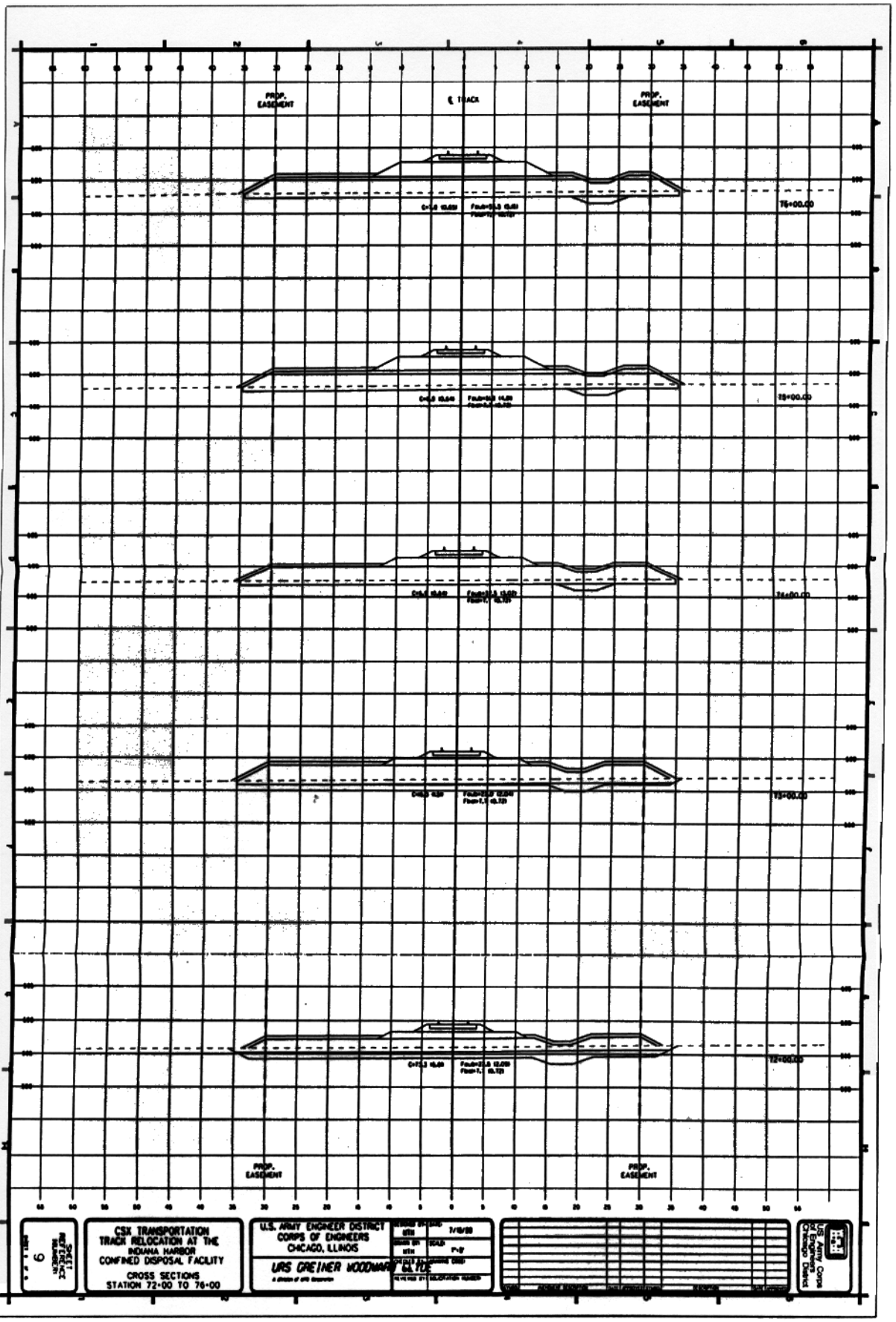
U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
CHICAGO, ILLINOIS

URS GREINER WOODWARD CLYDE

DESIGNED BY: MTH | DATE: 7/15/99
DRAWN BY: MTH | SCALE: 1"=5'
CHECKED BY: | DRAWING CODE:
REVIEWED BY: | SOLICITATION NUMBER:

US Army Corps of Engineers Chicago District

PLATE F-7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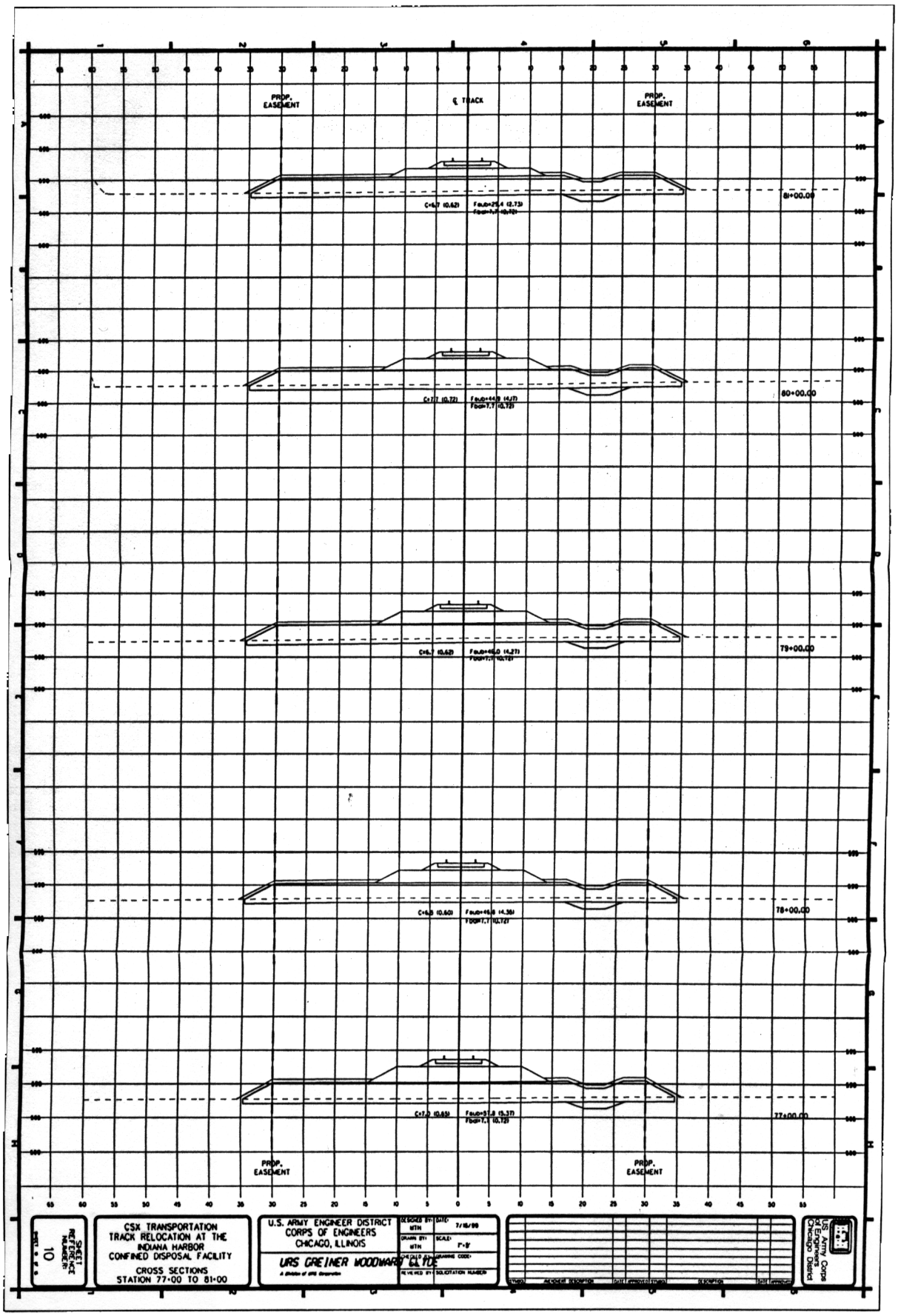
74+00.00
73+00.00
72+00.00
PROP. EASEMENT
PROP. EASEMENT
SHEET REFERENCE 9
CSX TRANSPORTATION
TRACK RELOCATION AT THE
INDIANA HARBOR
CONFINED DISPOSAL FACILITY
CROSS SECTIONS
STATION 72+00 TO 76+00
U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
CHICAGO, ILLINOIS
URS GREINER WOODWARD CLYDE
1/8/99
SCALE 1"=5'
U.S. Army Corps of Engineers Chicago District

PLATE F-8



SHEET NUMBER 10 OF 10 SHEETS

CSX TRANSPORTATION
TRACK RELOCATION AT THE INDIANA HARBOR CONFINED DISPOSAL FACILITY
CROSS SECTIONS STATION 77+00 TO 81+00

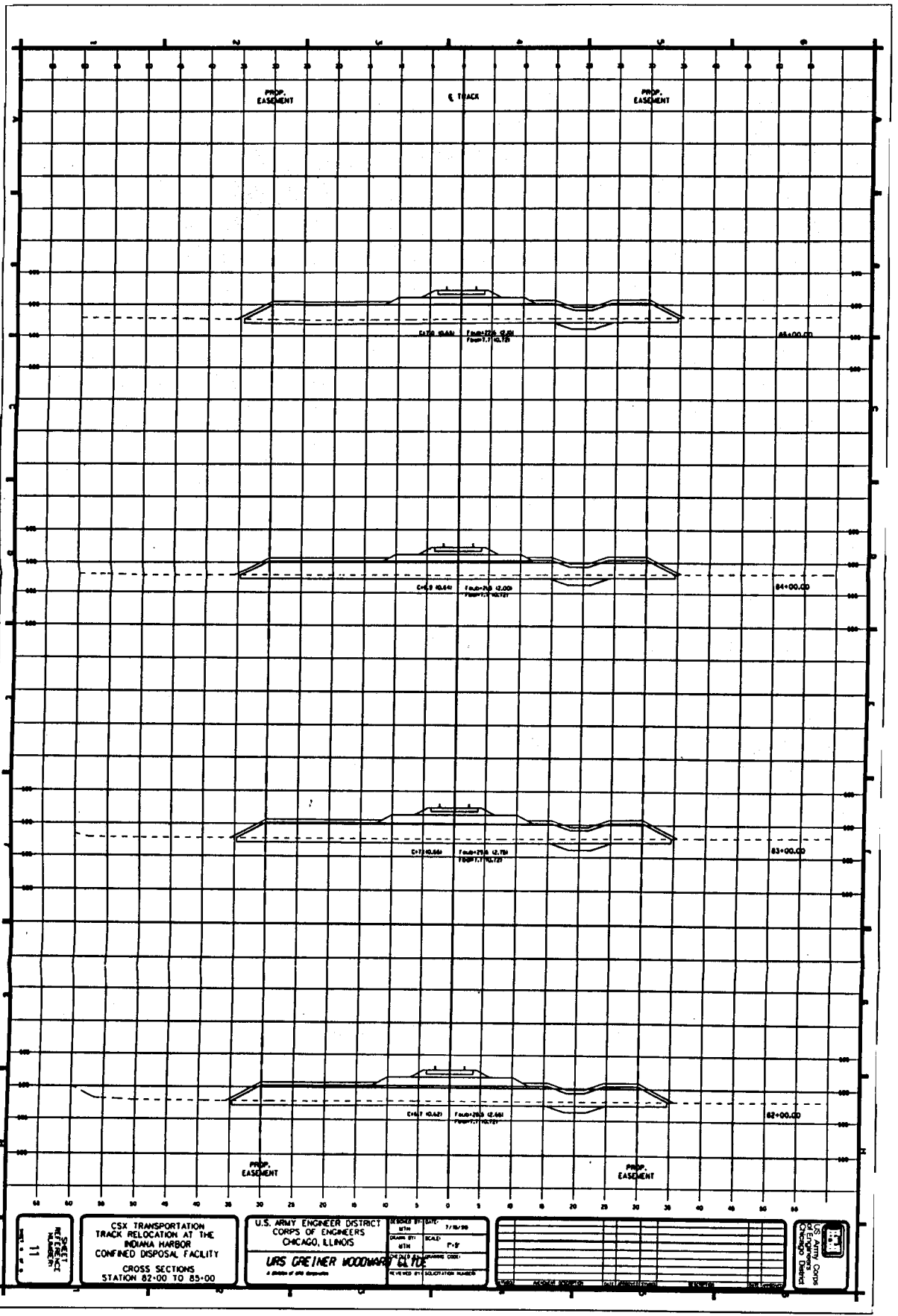
U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
CHICAGO, ILLINOIS

URS GREINER WOODWARD CLYDE
A Division of URS Corporation

DESIGNED BY: MTH	DATE: 7/15/99
DRAWN BY: MTH	SCALE: 1"=5'
CHECKED BY:	DRAWING CODE:
REVIEWED BY:	SOLICITATION NUMBER:

NO.	REVISION DESCRIPTION	DATE	APPROVED	DESCRIPTION	DATE

US Army Corps of Engineers Chicago District



CSX TRANSPORTATION
TRACK RELOCATION AT THE
INDIANA HARBOR
CONFINED DISPOSAL FACILITY

CROSS SECTIONS
STATION 82+00 TO 85+00

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
CHICAGO, ILLINOIS

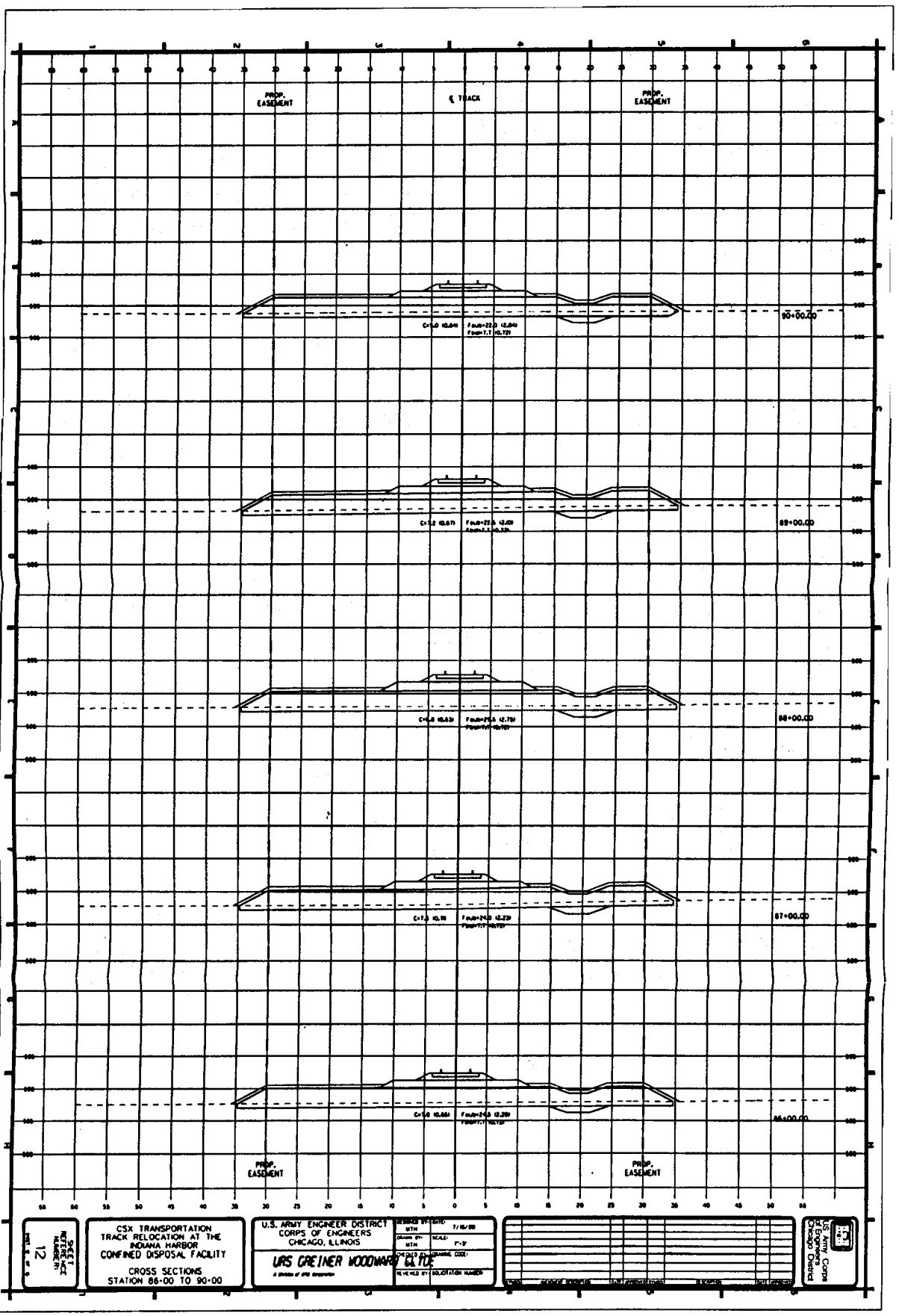
URS GREINER WOODWARD CLYDE

DESIGNED BY: MTH DATE: 7/15/99
DRAWN BY: MTH SCALE: 1"=5'
CHECKED BY: DRAWING CODE:
REVIEWED BY: SOLICITATION NUMBER:

SHEET NUMBER 11

U.S. Army Corps of Engineers Chicago District

PLATE 5



CSX TRANSPORTATION
TRACK RELOCATION AT THE
INDIANA HARBOR
CONFINED DISPOSAL FACILITY

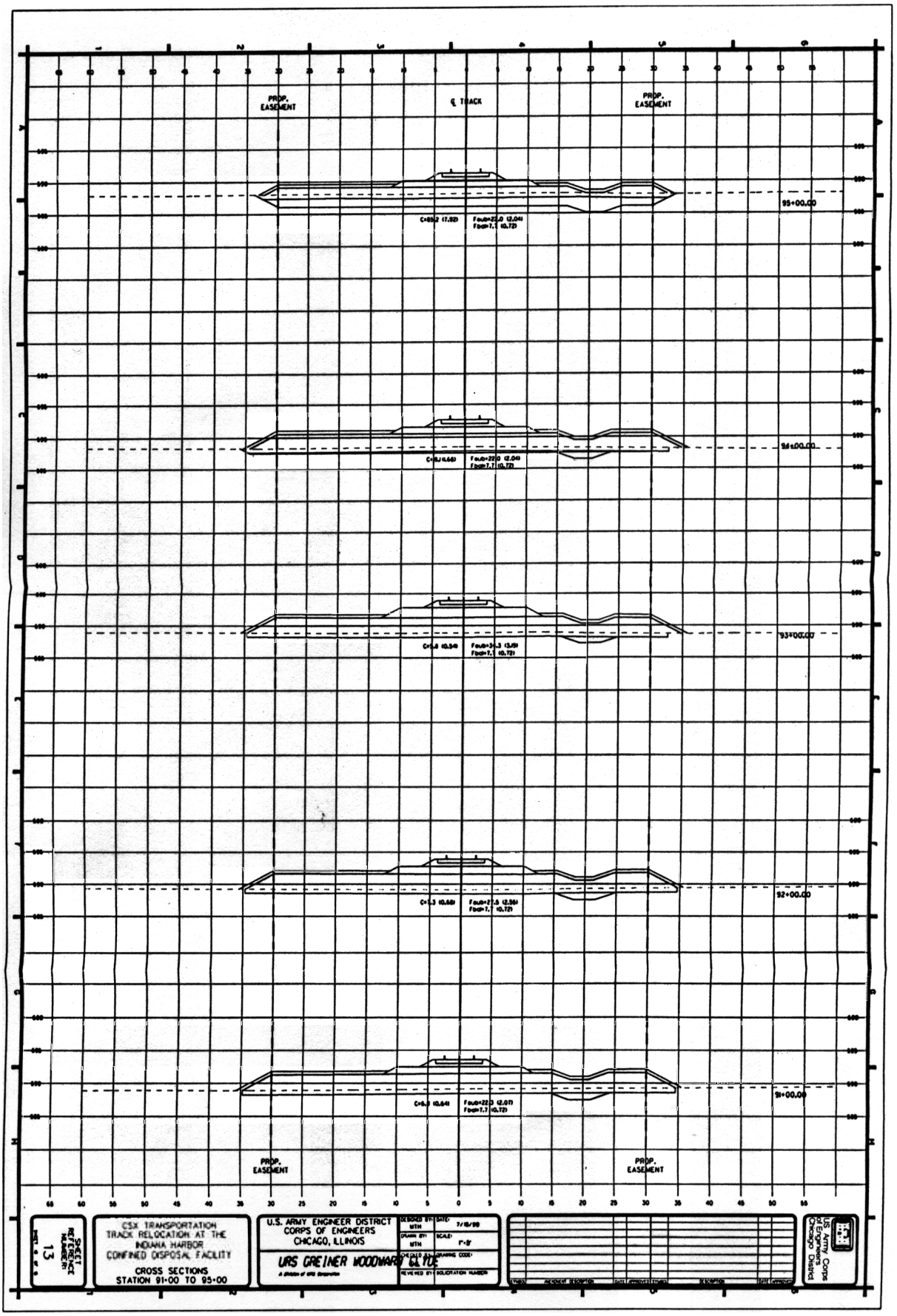
CROSS SECTIONS
STATION 86-00 TO 90-00

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
CHICAGO, ILLINOIS

URS GREINER WOODWARD CLYDE

SHEET NUMBER 12

U.S. Army Corps of Engineers
Chicago District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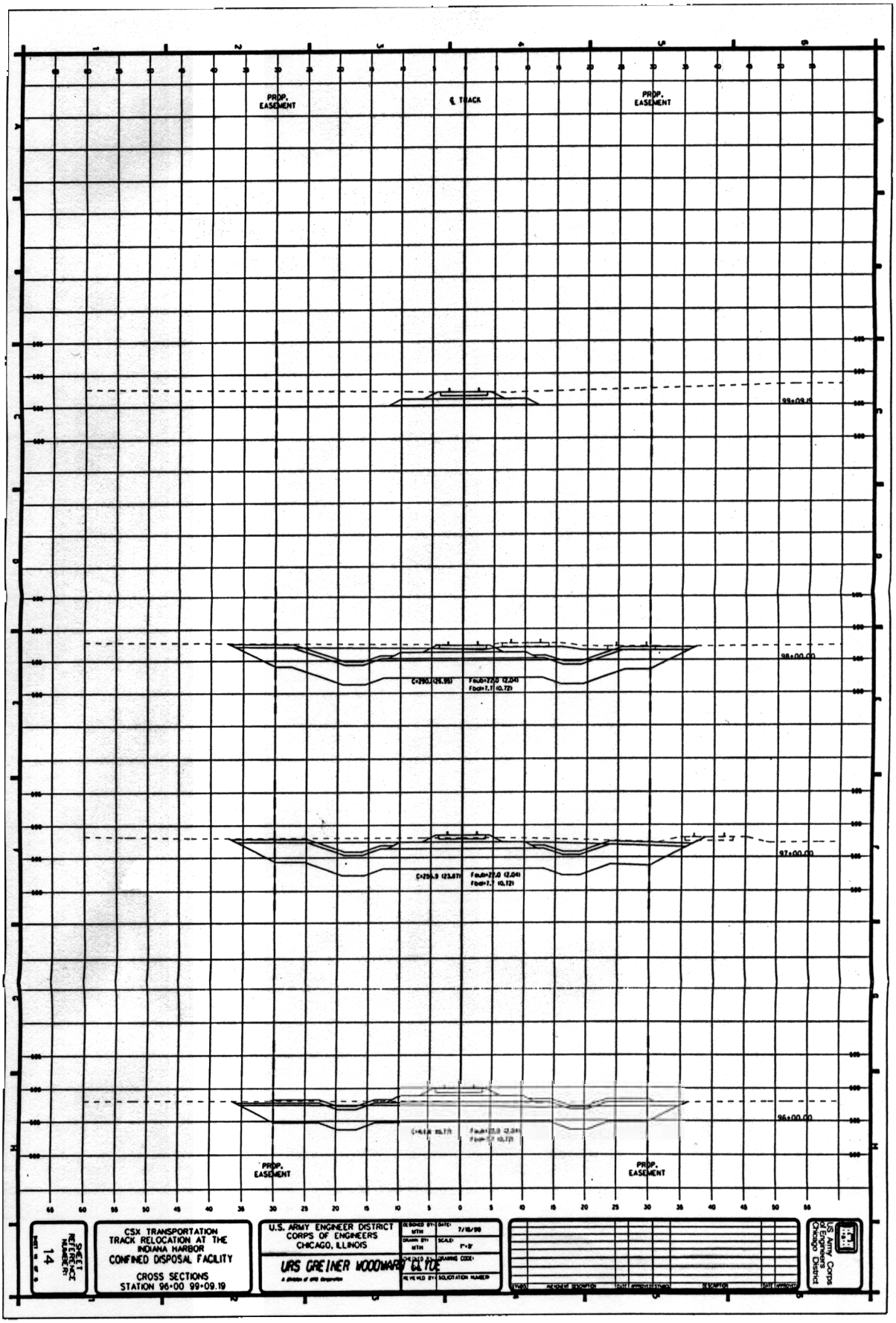
CSX TRANSPORTATION
TRACK RELOCATION AT THE
INDIANA HARBOR
CONFINED DISPOSAL FACILITY
CROSS SECTIONS
STATION 91+00 TO 95+00
U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
CHICAGO, ILLINOIS
URS GREINER WOODWARD CLYDE
DESIGNED BY MTH
DRAWN BY MTH
CHECKED BY
REVIEWED BY
DATE 7/15/99
SCALE 1"=5'
DRAWING CODE
SOLICITATION NUMBER
U.S. Army Corps of Engineers Chicago District

PLATE F-12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PROP. EASEMENT
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CSX TRANSPORTATION
TRACK RELOCATION AT THE
INDIANA HARBOR
CONFINED DISPOSAL FACILITY
CROSS SECTIONS
STATION 96+00 99+09.19
U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
CHICAGO, ILLINOIS
URS GREINER WOODWARD CLYDE
DESIGNED BY: MTH
DRAWN BY: MTH
CHECKED BY:
REVIEWED BY:
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SCALE: 1"=5'
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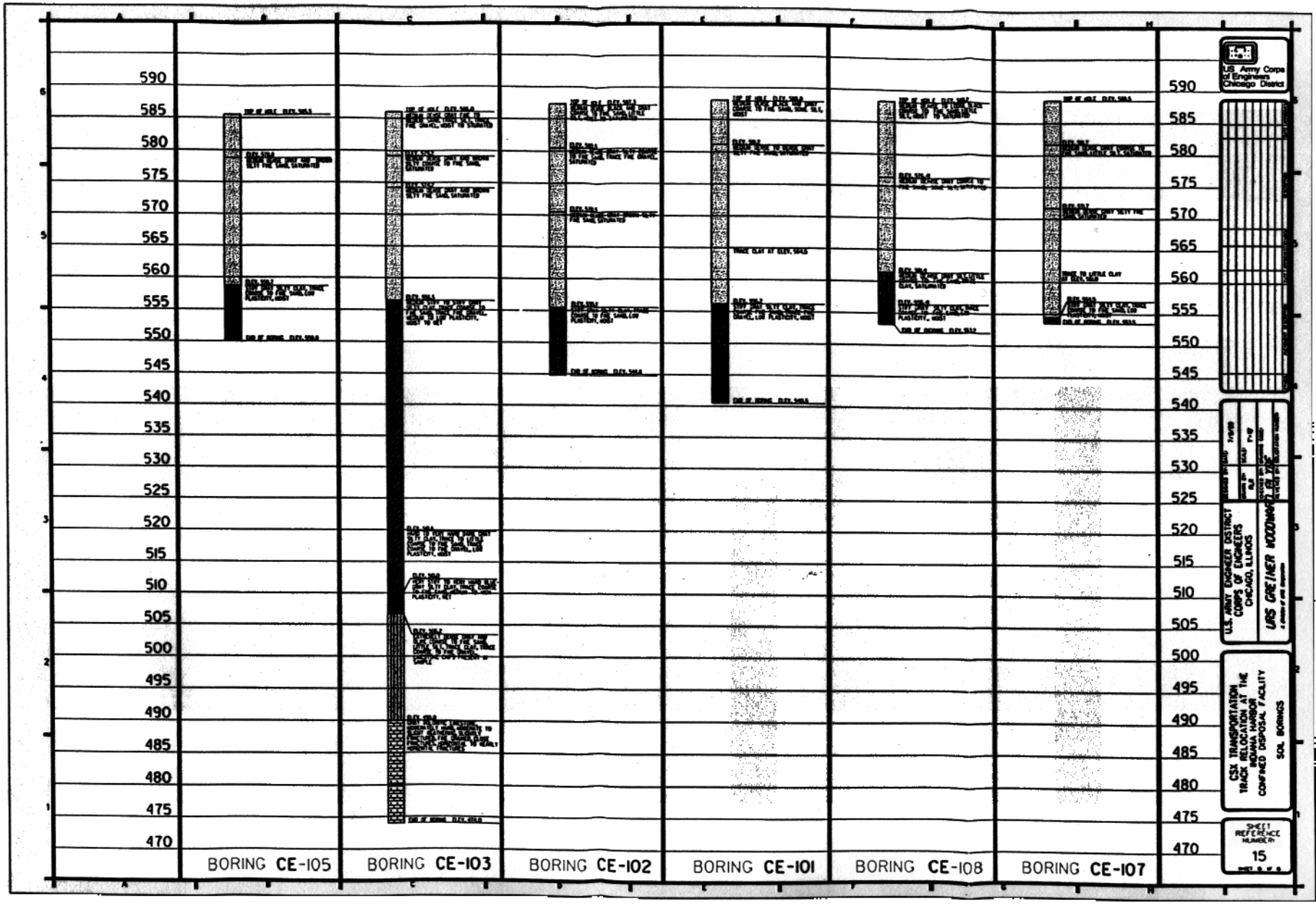
SOLICITATION NUMBER:
US Army Corps of Engineers Chicago District

PLATE F-13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BORING CE-105
BORING CE-103
BORING CE-102
BORING CE-101
BORING CE-108
BORING CE-107
US Army Corps of Engineers Chicago District
U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS CHICAGO, ILLINOIS
USS GREINER WOONASQUATUCK JV, INC.
CSX TRANSPORTATION TRACK RELOCATION AT THE INDIANA HARBOR CONFINED DISPOSAL FACILITY
SOIL BORINGS
SHEET REFERENCE NUMBER
15

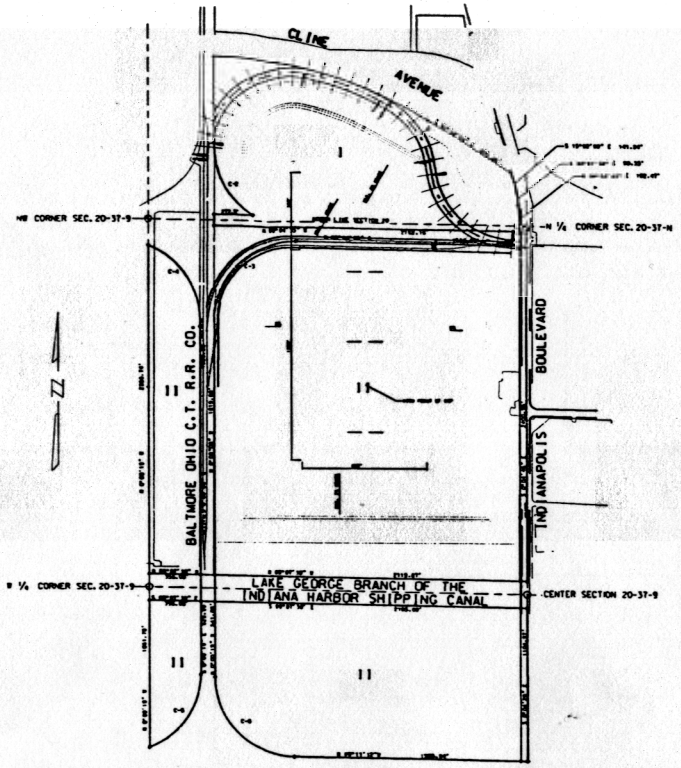
PARCEL 1:

That part of the South Half (S½) of the Southwest Quarter (SW¼) of Section Seventeen (17), Township Thirty-Seven (37) North, Range Nine (9) East of the Second Principal Meridian, lying East of the right-of-way of the Chicago and Calumet Terminal Railroad, conveyed by deed dated January 3, 1888, and recorded in the Recorder's Office of Lake County, Indiana, June 15, 1888, in Book 96, pages 81 and 82, EXCEPTING THEREFROM the following tracts, to-wit:

That part thereof conveyed by deed dated July 28, 1874, to the Indiana Pipe Line Company, a corporation of Indiana, which deed was rerecorded October 10, 1874, in the Recorder's Office of Lake County, Indiana, in Book 56, pages 173 and 174; that part thereof conveyed by deed dated July 6, 1874, to the East Chicago Belt Railroad Company, a corporation of Indiana, said deed being rerecorded August 1, 1874, in the Recorder's Office of Lake County, Indiana, in Book 52, pages 35 to 45, inclusive; that part thereof conveyed by deed dated July 22, 1874, to the Western Indiana Railway Company, a corporation of Indiana, said deed being rerecorded in said Recorder's Office on October 27, 1874, in Book 79, pages 304 to 316, inclusive, and that part thereof conveyed by the Company to South Chicago and Southern Railroad Company by deed dated September 17, 1919 and rerecorded October 4, 1921, in Deed Record 276, pages 505, except that portion conveyed to MARCE Oil Company, a Maryland corporation, in Trustee's Deed recorded March 24, 1964 as Document No. 750613 and conveyed to the State of Indiana in Trustee's Deed recorded April 6, 1964, as Instrument No. 752496.

PARCEL 2:

The Northwest Quarter (NW¼) and the North Half (N½) of the Southwest Quarter (SW¼) of Section Twenty (20), Township Thirty-Seven (37) North, Range Nine (9) East of the Second Principal Meridian, in the City of East Chicago, Lake County, Indiana; EXCEPTING THEREFROM a Grant to the United States of America, recorded April 15, 1889, in Miscellaneous Record 44, page 472, for a two hundred (200) foot canal, and also EXCEPTING the present right-of-way of the Chicago and Calumet Terminal Railway Company, and the South Chicago and Southern Railway Company.



CURVE DATA TABLE

CURVE	DELTA	RADIUS	ARC	CHORD BEARING & DISTANCE
C-1	32°05'11"	2804.70'	1568.99'	S 73°13'30" E - 1550.21'
C-2	58°18'22"	573.70'	583.82'	N 29°13'45" W - 560.28
C-3	90°55'21"	573.70'	910.40'	N 45°27'42" E - 817.84'
C-4	71°47'49"	573.70'	719.68'	S 31°37'54" W - 672.78'
C-5	67°40'09"	573.70'	677.57'	S 33°51'19" W - 638.87'
C-6	89°08'58"	573.70'	892.65'	S 44°35'46" E - 805.29'

LEGEND

- GOV'T CORNERS W/PHSICAL MONUMENT
- GOV'T CORNERS W/NO MONUMENT ESTABLISHED
- FENCE
- RAILROAD
- BOUNDARY LINE
- SECTION LINE

E.C.I. REFINERY SITE

URS GREINER WOODWARD CLYDE

SECTION 20
T-37-N. R-9-W

PLATE F-15